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The Adoption of E-procurement in the Indonesian Public Sector

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

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ABSTRACT

Electronic procurement (e-procurement) is beginning to transform the way in which the Indonesian government performs their procurement activities. E-procurement adoption has the potential to bring a wide range of strategic, operational and tactical benefits when adopted in the public sector. E-procurement is seen as a mechanism for providing better services to the public and consequently has been at the forefront of public procurement reform in many countries. Notably, e-procurement has a key role in ensuring effective governance and public administration. Recognising the potential benefits, many public organisations have adopted e-procurement to improve efficiency and add value to the services they provide to their stakeholders.

Adopting e-procurement, however, is a complex, costly, and time-consuming task, with many organisations struggling to deliver the expected benefits. To ensure benefit realisation, organisations need to undertake suitable assessment and evaluation of new systems. This requires consideration of all inter-related e-procurement aspects and collation of the feedback necessary to support learning and refinement of the system. Evaluation is crucial for assessing the Information System/Information Technology (IS/IT) investments and has been the key to their successful implementation. Yet, in practice, such formal evaluation is not performed in many organisations, and even when the evaluation exists, it is likely to be inefficient and ineffective. Whilst it is well understood that it is important to undertake careful evaluation of e-procurement adoption, the studies and concepts for e-procurement systems evaluation, however, have not been adequately explored. There have been only a limited number of studies on evaluation of e-procurement, particularly within the public sector context. To address this issue, the primary aim of the research presented in this thesis was to determine the variables that influence successful e-procurement adoption within the Indonesian public sector and develop a comprehensive evaluation model.

In satisfying this primary aim, the research was undertaken in two main phases employing 'sequential triangulation'. In phase one, five case studies in conjunction with the normative literature were used to develop a conceptual evaluation model. A total of 34 interviews with experienced e-procurement practitioners from five Indonesian public organisations were undertaken and as a result five constructs for successful e-procurement adoption were identified: (1) costs, (2) benefits, (3) risks, (4) success factors and (5) quality.

The findings from the case studies were used in phase two as a theoretical base to develop a series of hypotheses, which were subsequently tested using a survey questionnaire. These hypotheses examined whether the identified variables in the proposed model were significant for evaluating e-procurement adoption. A total of 217 government officials dealing with e-procurement activities in Indonesia completed the questionnaire survey. The data and hypotheses were analysed using Structural Equation Modelling (SEM) with a confirmatory factor analysis (CFA) approach. The results confirmed that the five e-procurement constructs formed a critical part of the e-procurement evaluation process. Despite minor variances, with some variables shown to be insignificant, the analysis confirmed the model was consistent with the theoretical framework and the findings from case studies.

The literature review, in conjunction with the findings from the case studies and the questionnaire survey, were used to develop the final model for evaluating public e-procurement adoption. The model is then operationalised within the context of a benefits realisation management (BRM) framework that focuses on the costs, risks, performance and quality of e-procurement. The BRM framework also suggests that a change management strategy to support organisational learning with an emphasis on people, organisation, knowledge and technology is required to support e-procurement adoption within Indonesia.

DEDICATION

This thesis is dedicated to:

Chrisnawati Rumpang

My wife, my sweetheart,

who never once stopped believing in me, even when I have had doubts.

Muhammad Zaidan and Muhammad Fauzy

My sons, my pride,

for all your understanding and sacrifice.

In loving memory of:

My father, **H. Napsah Baso**

and

My late mother, **Hj. Husnah Djamaluddin**

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The completion of my study is a great achievement in my life. However, this great accomplishment was not completed on my own. Therefore, I wish to express my gratitude to all of the people who have contributed and helped me throughout my journey to complete my studies.

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LIST OF ABBREVIATIONS

ABR: Active Benefit Realisation

AGFI: Adjusted Goodness-of–Fit Index

AMOS: Analysis of Moment Structures

AVE: Average Variance Extracted

BAPPENAS: *Badan Perencanaan Pembangunan Nasional* - The National Development Planning Ministry

BPKP: *Badan Pemeriksa Keuangan Pusat* - the Financial and Development Supervisory Agency

BRM: Benefit Realisation Management

B2B: Business-to-business

CFA: Confirmatory Factor Analysis

CFI: Comparative Fit Index

CR: Construct Reliability

CSF(s): Critical Success Factor(s)

E-Government: Electronic Government

E-Procurement: Electronic Procurement

EPQ: E-Procurement Quality

EVA: Economic Value Analysis

GDP: Gross Domestic Product

GFI: Goodness-of-Fit Index

G2C: Government to Civilians

G2B: Government to Business

G2G: Government to Government

IS/IT: Information System/Information Technology

ICT: Information Communication Technology

IRR: Internal Rate of Return

ISQ: Internal Service Quality

KPI(s): Key performance Indicators(s)

LEMSANEG: *Lembaga Sandi Negara* - the National Coding Agency

LKPP: *Lembaga Kebijakan Pengadaan Pengadaan Barang/Jasa Pemerintah* - The Policy Institute for Procurement of Goods and Services

LPSE: *Layanan Pengadaan Secara Elektronik* - The e-Procurement Service Unit

MI: Modification Index

MRO: Materials, Repairs and Operating

NFI: Normed Fit Index

NPV: Net Present Value

POU: Prior Operational Use

RMSEA: Root Mean Square Error of Approximation

SEM: Structural Equation Model

SERVQUAL: Service Quality

SME(s): Small Medium Enterprise(s)

SPSE: *Sistem Pengadaan Secara Elektronik* – The E-procurement System

SPSS: Statistical Package for the Social Sciences

SRMR: Standardized Root Mean Square Residual

TAM: Technology Acceptance Model

TLI: Tucker Lewis Index

TOE: Technology-Organization-Environment

TPB: Theory of Planned Behaviour

ULP: *Unit Layanan Pengadaan* - The Procurement Service Unit

UK: The United Kingdom

USA: The United States of America

USAID: United States Agency for International Development

CHAPTER 1
INTRODUCTION

1.1 Background

Public procurement is the purchasing process that includes the sourcing, ordering, exchanging and storing of information (Assar and Boughzala, 2007) and involves complex interrelationships between government and civilians (Government to Civilians-G2C) and between government and business (Government to Business-G2B), while also improving internal coordination between public organisations (Government to Government-G2G). The rapid evolvement of information and communication technology also has changed the way public procurement is performed. Over the last decade, governments worldwide have adopted an Information System/Information Technology (hereafter referred to as IS/IT)-based service known as electronic procurement (hereafter, referred to as e-procurement). E-procurement can be defined as a comprehensive process of obtaining materials and services through the use of IT systems (Gunasekaran and Ngai, 2008). E-procurement has been an effective way for the public sector to improve the efficiency of the process and to minimise the costs of procurement (Hsiao and Teo, 2005). It is a strategic driver that is evident in the value of a public organisation and extends through its supply chain (Hawking *et al*., 2002). Notably, e-procurement plays a key role in achieving effective public administration and good governance adherence (Croom, 2007). Thus, there have been positive trends towards the adoption of e-procurement in the public sector, implying its significance to many organisations (Assar and Boughzala, 2007).

There is a plethora of literature espousing the benefits and the drivers of e-procurement (Subramaniam and Shaw, 2002; Presutti, 2003; Gunasekaran *et al.*, 2009). Many drivers underpin e-procurement adoption, including: trends in global sourcing; emphasis on 'time to market', growing pressure to reduce costs, compliance issues, customer uncertainty; product quality/competitive advantage; and new pricing models and supplier networks (Kalakota and Robinson, 2001). As a

consequence, benefits such as improved efficiency and effectiveness of the e-procurement process are generally acknowledged. Along a similar line, Minahan and Degan (2001) highlighted some benefits that include savings in cost (administration, operation and inventory) and time, contract compliance improvements, enhanced market data, improved relationships with and responsiveness to partners/stakeholders, and increased efficiency, efficacy and accuracy of production.

Based on their importance, e-procurement benefits can be classified into the three main categories of strategic, operational and tactical (Croom, 2000; Attaran, 2001; Kalakota and Robinson, 2001; De Boer *et al.*, 2002; Love *et al.*, 2005; Piotrowicz and Irani, 2010, Panwar and Srivastava, 2014; Rahim and Kurnia, 2014). Strategically speaking, the benefits relate to organisational change, comparative efficiency, customer service improvement and competitive/market advantages (Attaran, 2001). Another factor is the ability to increase control and influence over the total supply base and expenditure (Piotrowicz and Irani, 2010). Operational benefits emerge from processes, activities, or functionalities of an organisation and concern the effectiveness and efficiency of transactional/purchasing activities, as well as improvements in the ability to audit each transaction process (Mukhopadhyay and Kekre, 2002). Whereas, tactical benefits are acquired from specific processes that can be determined directly, including improved and better explored relationships, support for decision-making and timely communication.

While public sector organisations can obtain significant benefits from e-procurement adoption, all organisations should be aware of the significant costs associated with its adoption. Notably, e-procurement initiatives are complex, time-consuming and costly to implement due to the significant capital investment and high deployment costs (e.g., operation, maintenance and upgrades) of the system (Gunasekaran and Ngai, 2008; Hawking *et al.*, 2004; Wirtz *et al.*, 2009). Fundamentally, there are two classes of costs based on their source: direct and indirect (Irani and Love, 2001). Direct costs emerge from the labour force, administration and operation of e-procurement while indirect costs relate to the impact of e-procurement on the organisation and the people.

The prevalence of risks has been a recurrent problem in e-procurement adoption, which, if not identified and managed, can affect the potential value of the system (Love *et al.*, 2005) and negatively impact further adoption (Kusuma and Pramunita, 2011). Such risks can emerge from many external factors associated with the environment, such as partnerships, processes and organisational aspects (Chang *et al.*, 2008). They also can be attributed to technological, organisational and personal elements of e-procurement that arise within the business itself.

To better prepare for an e-procurement adoption plan, a better understanding of factors leading to success is critical in order to reap the optimum benefits of the system (Vaidya *et al*., 2006). Arbin (2008) identifies certain critical success factors such as end-user uptake and change management, process re-engineering, supplier's management, and technology and catalogue management. A study by Gardenal (2010) has proffered a triangle of people-process-technology factors that influence e-procurement uptake. Notably, three major factors are deemed to contribute to its successful adoption: organisational, technological and environmental factors (Chan, 2002; Vaidya *et al.*, 2006; Chong and Pervan, 2007; Teo *et al.*, 2009; Hassan *et al.*, 2010, Li *et al*., 2015). Technological factors include compatibility, complexity, technology standards and system integration. Organisational refers to process re-engineering, management support, sharing knowledge, networking and training. Whereas, the environmental focus is on dependency from partners, supplier acceptance and pressure/support from external sources.

Another critical dimension for every organisation to assess is the impact of adopting e-procurement on its performance and quality. Overwhelmingly, the impact of e-procurement adoption has been reported to be profoundly positive (Gebauer and Segev, 2001; De Boer *et al.*, 2002; Croom and Johnston, 2003; Vaidyanathan and Devaraj, 2007; Gardenal, 2010; Tai *et al.*, 2010; Brandon-Jones and Carey, 2011). E-procurement became apparent as a contributer to internal customer service and compliance improvement (Croom and Johnston, 2003). A critical factor that influences e-procurement compliance has been system quality (Reunis *et al.*, 2004; Brandon-Jones, 2006; Rotchanakitumnuai, 2013). Vaidya *et al.* (2004) highlighted the need for measuring the performance and quality of e-procurement adoption.

Several studies have introduced the measurement of e-procurement quality to improve e-procurement compliance (Raaij *et al*., 2007; Brandon-Jones, 2008 and 2009; Sharabati, 2014).

While many academics and practitioners make a strong case for e-procurement adoption, many public sectors in several countries have obtained only marginal benefits from adopting e-procurement (Kheng and Al Hawamdeh, 2002; Liao *et al.*, 2003; Seong and Lee, 2004; Yusoff *et al.*, 2011). Many studies also reported disappointingly low adoption rates than were initially predicted (Davila *et al.*, 2003). An underlying reason that has contributed to this is the complexity of e-procurement adoption within public sectors. Against this contextual backdrop, an evaluation of e-procurement should be undertaken to ensure optimal benefit from the investment in e-procurement adoption.

Although there have been many attempts to evaluate e-procurement adoption, there has been no single research instrument that has provided a comprehensive measurement of e-procurement initiatives. This is because not all concepts involved in e-procurement systems evaluation have been adequately explored. There is limited history and academic literature regarding e-procurement assessment in the public sector (Tonkin, 2003; Vaidya *et al.*, 2006). The current studies within e-procurement evaluation literature show a lack of core constructs and are limited in their scope. Many studies on e-procurement impacts are based on conceptual analyses and case studies, resulting in a lack of broad empirical evidence (Subramaniam and Shaw, 2002; Davila *et al.*, 2003; Lancioni *et al.*, 2003; Madeja and Schoder, 2003; Tonkin, 2003; Brandon-Jones and Croom, 2005). Notably, there is a gap in the literature when analysing and evaluating e-procurement (Mora-Monge *et al.,* 2010; Fernandes and Vieira, 2015).

To address this point, evaluating e-procurement can be viewed as an iterative process that looks beyond the many individual key themes of e-procurement adoption. Borrowing the perspective from IS/IT evaluation, a balanced approach should be conceptualised to enable the manager to undergo an evaluation that incorporates realisation of benefits, a costs portfolio and management of risks (Anandarajan and

Wen, 1999; Irani *et al.*, 2005). Likewise, Birks *et al.* (2001) assert the need for identifying drivers, benefits, approaches, risks and benefit realisation to ensure that the implemented e-procurement delivers the expected results. This suggests that, by looking at various indicators of evaluation, a better understanding of e-procurement adoption can be achieved.

A thorough study of the relevant literature and previous studies has allowed establishment of a model to evaluate e-procurement in the public sector by framing the determinants of costs, benefits, risks, success factors and quality dimensions in a collective manner, ensuring that the evaluation can be better explored. This research focuses on public e-procurement adoption. The proposed framework can be employed as a blueprint for evaluation of e-procurement adoption in Indonesia. The study will provide a firm foundation and deeper insights to generate more 'value' from future e-procurement investments.

1.2 Research Objectives

The existence of a form of evaluation for e-procurement adoption is crucial to enable continuous improvement and to acquire full advantages from its implementation (Panayiotou *et al.*, 2004). Thus, evaluating e-procurement adoption requires suitable frameworks that address the key themes emerging from public e-procurement adoption (Gunasekaran and Ngai, 2008; Gardenal, 2013). The purpose of the present study is to reveal the ideal evaluation of e-procurement adoption for public sector/government procurement in Indonesia. In this study, five cornerstones emerged that are critical elements to successful e-procurement adoption: costs, benefits, risks, success factors and quality. Specific objectives include to:

- identify the determinants of benefit, cost, risk, critical success factors and quality of public e-procurement adoption;
- design and develop a framework for the evaluation of successful e-procurement adoption; and
- evaluate the e-procurement adoption framework.

1.3 Significance of the Research

Numerous studies have revealed the significance of e-procurement adoption. Gartner's research (2001 and 2012) indicates the potential saving of 10-20% in the adopting of such a system. Additionally, a survey by Aberdeen Group (2001, 2008 and 2011) also found saving ranging from 5% to 20%. From the literature, various statistics of savings have emerged from e-procurement adoption (Croom, 2000; Lin and Hsieh, 2000; Subramaniam and Shaw, 2002; Croom and Johnston, 2003; Davila, *et al.,* 2003; Croom and Brandon-Jones, 2004; Panayiotou *et al.,* 2004; Ronchi *et al*., 2010).

Within the context of Indonesian public e-procurement, expenditure on procurement accounts for approximately 30% of the total state budget, and is 10% of Gross Domestic Product (Malik, 2007). Moreover, Wahid (2009) highlights that such expenditure may account for as much as 70% of the budget in some government departments. From this illustration, the large proportion of these expenses in the public sector indicates the need to perform procurement efficiently and effectively to obtain cost savings and, therefore, to minimise the financial burden placed on taxpayers. Notably, e-procurement adoption in the Indonesian public sector enables savings that have been accounted between 20% and 40%. For example, the reported experience of the first adopters in the city of Surabaya provided cost savings of 50% for small contracts and 23% for larger ones (Wahid, 2009). Another study by Jasin (2008) revealed e-procurement could generate savings of 13% to 24%.

Also, there have been positive trends in e-procurement adoption nationwide. To date, there are 1,220 independent e-procurement units at all levels of government entities throughout Indonesia. More adopters are expected to join every year. Hence, e-procurement has been perceived as a key enabler for greater savings in national expenditure. To acquire full benefits from e-procurement, the existence of an evaluation framework is critical for the successful delivery of public e-procurement. Thus, there has been a demand to conceptualise a framework for evaluating current Indonesian public e-procurement that incorporates the key determinants of benefit,

cost, risk, success factor and quality of e-procurement (Gunasekaran and Ngai, 2008).

However, there is a paucity of concepts for e-procurement systems evaluation, especially within the public sector context (Tonkin, 2003; Vaidya *et al.*, 2006). There has been a gap in the literature addressing the evaluation of e-procurement (Mora-Monge *et al.,* 2010; Fernandes and Vieira, 2015). As a consequence, there has been no generally accepted conceptualisation of e-procurement evaluation, which is problematic in designing or modifying evaluation approaches for e-procurement adoption. In the context of Indonesia, there is limited literature available discussing public e-procurement adoption. The possible explanation for this could be that the technology is still in its immature stage with its own peculiarities. It, therefore, requires further development and refinement (Smart, 2010).

To fill this gap, this study attempts to develop a comprehensive framework to evaluate an e-procurement system elaborately, considering not only the benefits but also other determinants of costs, risks, success factors and quality of e-procurement. It is expected to provide better understanding and greater insights towards public e-procurement adoption in Indonesia. This study, perhaps, also will enlighten other researchers and enrich the knowledge for further e-procurement development in Indonesia. Furthermore, this will be beneficial to:

- provide assistance for early adopters and those who are intent on its adoption: and
- provide advice and suggestions for further strategic policy-making and research in e-procurement development at all government levels in Indonesia.

1.4 Research Methodology

From the literature, many studies in the past have performed assessment and evaluation for e-procurement adoption. Various approaches have been used by previous researchers in e-procurement adoption, mostly using both qualitative and quantitative approaches. The recent research postulates the use of the mixed method,

by triangulating both methods. It has been a popular and useful method for studying and evaluating e-procurement adoption. Likewise, triangulation of qualitative and quantitative methods will be used in this study. Together with the review of relevant literature, the mixed method exploits case study interviews for qualitative data and survey questionnaires for quantitative data. The research is designed using sequential triangulation, in which both qualitative (case study) and quantitative (questionnaire) methods are employed in combination to explore the topic of the study (Abowitz and Toole, 2010; Leicht *et al.*, 2010).

The research starts with a comprehensive review of literature related to the topic. A summary pertaining to state-of-the-art evaluation of e-procurement adoption will be presented. This provides the basis for conceptualisation of the research topic into themes and a framework. The proposed framework is to be validated via the data collection. In fact, as the research progressed, the literature was updated and refined to support the findings from the case studies and the survey. Following the literature review, the case studies were performed to verify and refine the conceptual model. Semi-structured interviews were used to gather qualitative data from five case studies. Besides the interviews, the complementary source for data was documentary evidence, using internal examples form organisations such as official websites and reports, as well as external sources such as related articles, papers and reports. The findings were used as the theoretical base for development of the survey questionnaire.

The questionnaire was developed through the online 'Survey Monkey' service and distributed to the potential respondents among the government officials who were known to be dealing with e-procurement activities nationwide in Indonesia. After that, the data was analysed to test the model and the hypotheses developed using the Structural Equation Model (SEM) approach. In the last stage, data from both the qualitative and quantitative sections were combined and discussed to synthesise findings. The details of the research methodology employed in this study are presented in Chapter 4.

1.5 Organisation of the Thesis

This thesis is organised into eight chapters, in which the chapters are related and complementary to each other. The organisation of the chapters is illustrated in Figure 1.1. A brief outline of the chapters is as follows:

- Chapter 1 discusses the research background, research objectives and research significance, and provides an overview of the methodology employed in this study. This chapter presents the overall organisation of the thesis.
- Chapter 2 provides a review of related literature to the study. This chapter includes a brief illustration of IS/IT evaluation techniques and benefits management, or the realisation of benefits of IS/IT investment. The chapter provides a summary of e-procurement adoption, addressing the determinants of the benefit, cost, risk and critical success factors of e-procurement adoption.
- Chapter 3 establishes the conceptual model/framework for evaluating e-procurement adoption in the public sector, based on the literature review. A discussion of existing models of adoption from the literature is presented. Also, this chapter describes the e-procurement qualities that are to be incorporated into the model, together with the determinants of benefit, cost, risk, and success factors as addressed in Chapter 2.
- Chapter 4 presents the research methodology that underpins this research. This chapter focuses on determining the most appropriate approach to be used when undertaking this research. It also provides the rationale and justification of the adapted method, in which the sequential triangulation of the case study and survey questionnaire methods has been selected. The details of the research procedure for the qualitative approach (semi-structured interviews as case studies) and quantitative approach (questionnaire) are explained. The underlying data analysis for both methods also is discussed in this chapter.
- Chapter 5 addresses the process and the results of the qualitative research through the study of five different cases. The semi-structured interviews were employed to collect the data, as well as relevant documentary sources. NVivo – qualitative data analysis software has been utilised to manage the qualitative data. This chapter also discusses the details of examination for both the 'within-case'

analysis of each case and 'cross-case' analysis across all five cases. Upon the findings from the qualitative analysis, the conceptual framework was modified and updated as the foundation for further study in the quantitative section using the questionnaire.

- Chapter 6 presents the results of the quantitative approach using a survey questionnaire. This chapter provides a detailed analysis of the quantitative data collected using the structural equation modelling (SEM) approach. Based on the results of the analysis, the confirmation of the model and the hypotheses is developed.
- Chapter 7 presents a discussion of the combined findings obtained from the quantitative and qualitative results and relates them to prior research. This chapter provides an evaluation of the e-procurement adoption determinants and offers explanations that support the proposed framework.
- Chapter 8 summarises the overall findings and conclusions of the research. It also presents the theoretical and practical implications of the research and recommendations for future study.

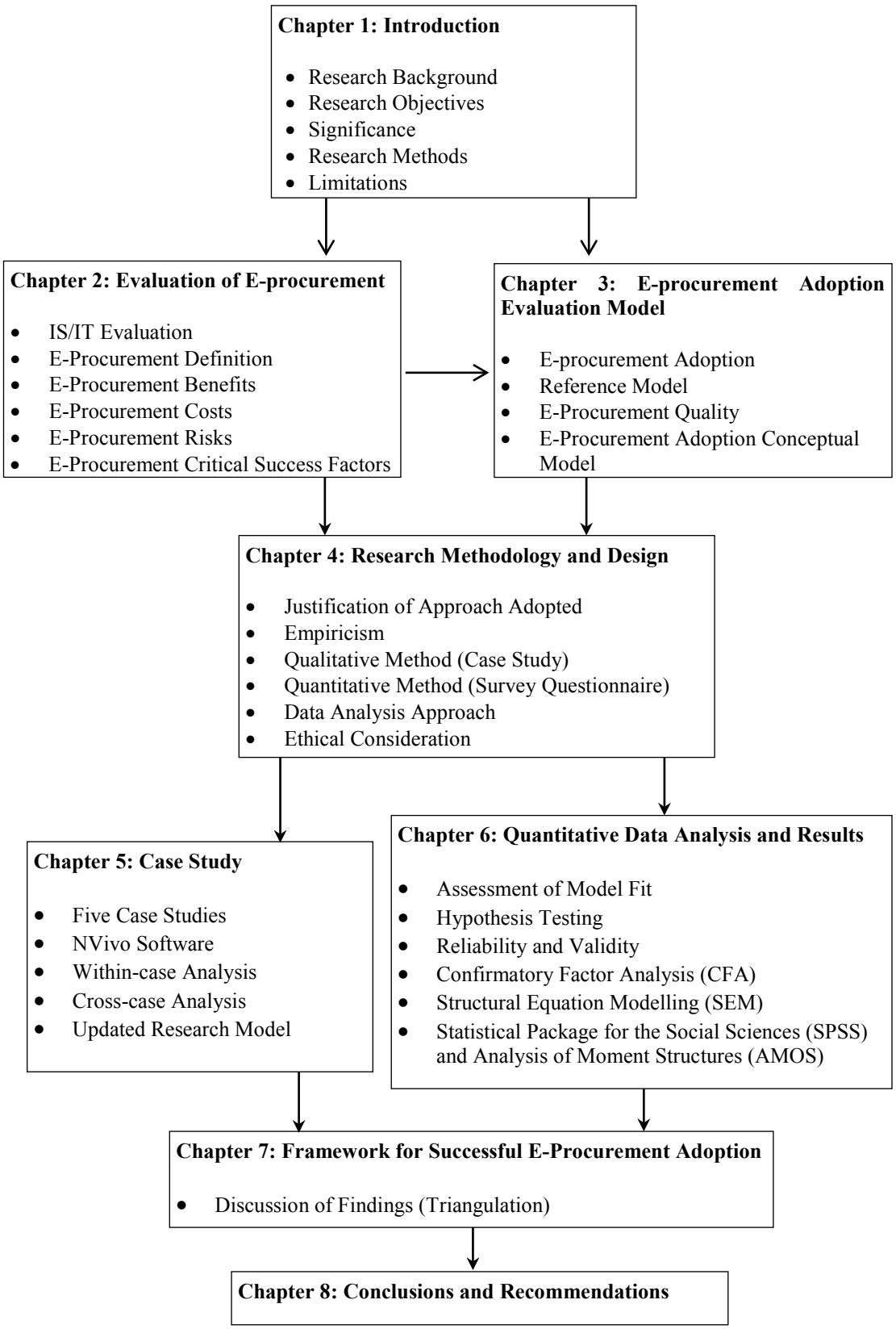

Figure 1.1 Organisation of the Thesis

1.6 Limitations

While the research to be presented has provided a worthy contribution to the normative literature there are a number of limitations that should be highlighted. Firstly, the research is limited in terms of its scope and sample size (i.e. restricted to users only through purposeful sampling) and, therefore, generalisations are unable to be made to the wider Indonesian public sector. For future research, a comparative study of the perceptions of the users and the providers needs to be conducted to elucidate this issue. It is suggested that the insights from both users and providers will offer clearer vision to understand better the real 'value' of e-procurement adoption. Additionally, the field of research undertaken only focuses on public e-procurement adoption. It is necessary to point out that the application of the proposed model may not be appropriate for general e-procurement adoption cases. Thus, the applicability of the model should be carefully considered in relation to the scope and complexity of e-procurement adoption.

1.7 Chapter Summary

This chapter provided the background for this study and presented an overview of the existing literature on e-procurement adoption. It identified a gap within the literature and explained how this research can address that gap. The significance of this study was presented and its research objectives were discussed. The limitations of this research were highlighted. Importantly, a brief illustration of the research methodology that was adopted has been provided. Finally, an outline of the organisation of this thesis was presented.

CHAPTER 2
E-PROCUREMENT EVALUATION: BENEFITS, COSTS, RISKS AND SUCCESS FACTORS

2.1 Overview

Information Systems/Information Technology has been an enabler for many organisations to conduct their business. In this chapter, the researcher will attempt to describe the IS/IT definition in general and discuss investment initiatives and the 'paradox' of IS/IT investment. The level of IS/IT investment in many organisations is significant and the portion of expenditure attributed to it is increasing every year, yet many companies struggle to reap the potential benefits. It is crucial that organisations pay extra attention to adopting appropriate evaluation of IS/IT to avoid investment sinkholes and to ensure that improved organisation performance is achieved. A plethora of methods and techniques have been discussed in the literature, and this chapter also provides a brief illustration of IS/IT evaluation techniques, such as predictive (*ex-ante*) and prescriptive (*ex-post*) methodologies. Furthermore, in developing a deeper understanding of the investment and its evaluation, the benefits management (or the realisation of the benefits of IS/IT investment) also will be presented.

To investigate and evaluate the adoption of e-procurement for the public sector, the literature review is organised into the following steps. Firstly, an introduction of e-procurement definitions and concepts is presented to give a brief summary from different angles and perspectives. The review of the literature aims to provide the necessary knowledge and understanding of the research area as a foundation for this study. It continues by addressing the issues of the benefits, costs, risks and critical success factors of e-procurement adoption. The review is then followed by a discussion on the quality dimensions of e-procurement.

E-procurement adoption in the public sector context also is presented and is comprised of a comparison of e-procurement from the public and private sector perspectives. Following that, the adoption of e-procurement in Indonesia's public sector is highlighted, covering the background, legal aspects and common practices.

2.2 Information Systems/Information Technology Evaluation

2.2.1 Introduction

Information Systems/Information Technology, today, is transforming and revolutionising the way organisations conduct their business. There has been growing significance placed on IS/IT to bring about modernisation and improvement (Wilson and Game, 2011), demonstrated by the large amount of money invested in it by many organisations (Powell, 1992; Willcocks, 1992). As a result, many organisations have become reliant upon IS/IT to obtain a strategic and competitive advantage (Earl, 1993; Remenyi and Sherwood-Smith, 1999; Love *et al.*, 2006) and to support their business processes.

IS/IT is a generic term that encompasses all activities for the acquisition, processing, storage, transfer and presentation of information (Bjork, 1999). It covers all components of the hardware and software, the personnel and the operational procedures that are involved in processing the data acquired. A study by Gunasekaran *et al.* (2001) segregates the definitions for Information Technology (IT) and Information System (IS) and states that an IT pertains to the hardware, software and resulting technologies while an IS relates to the design of an organisation's information flow. Investment for IS/IT has become a crucial part of many organisations, with these technologies and systems supporting the entire operation, including its management, analyses and decision-making (Wilcocks, 1994). The values of IS/IT can be derived from their positive consequences (benefits) and negative consequences (sacrifices), and these can be divided into financial and non-financial impacts.

2.2.2 IS/IT Investments and the 'Productivity Paradox'

Information Systems/Information Technology investment can be viewed as any use of software and hardware that is aimed to increase the benefits of an organisation's information systems (Willcocks, 1994). Baker and Berenblum (1996) proposed that IS/IT investment was one of the major factors determining the success or failure of organisations. As a result, IS/IT investments in many organisations are a significant and increasing portion of expenditure every year and, consequently, the adoption of IS/IT is expected to bring several strategic, tactical and operational benefits (Farbey *et al.,* 1995; Irani and Love, 2001). Earl (1989) recognised four main significances of IS/IT uses which include: to improve competitive advantage, to increase productivity, to introduce new management methods and to establish new business. Notably, the adoption of IS/IT can minimise costs and improve organisational efficiency, effectiveness and performance (Wamba *et al.*, 2008). Furthermore, a study by Love and Irani (2004) identified the motivations for organisations to adopt IS/IT as including: improving productivity (efficiency) and performance (effectiveness), increasing service quality and profitability, gaining competitive advantage and supporting the strategic direction of the organisation.

However, in contrast to this perspective there has been great concern that the contribution of IS investment does not always meet the expectations of value and goals (Renkema and Berghout, 1997; Irani and Love, 2002), because the overall costs of IS implementation may outweigh the cost savings and efficiency gains (Jones, 2008). The adoption of IS/IT can be a huge disappointment and can be deemed wasteful (Berghout, 2002) or considered to be an investment sinkhole (Irani *et al.,* 2003; Love *et al.,* 2005), due to it being too time consuming and costly to operate and maintain (Farbey *et al.*, 1999; Khorana *et al.,* 2015), with regular failures and negligible benefits (Irani and Love, 2001). Thus, a term that is known as the 'IT productivity paradox' has emerged to describe the inability of IS/IT to deliver the values that were initially predicted (Brynjolfsson, 1993; Hitt and Brynjolfsson, 1996; Strassman, 1997; Devaraj and Kohli, 2003; Thatcher and Pingry, 2004; Vaidyanathan *et al*., 2012).

Studies also suggest that the paradox is due to the lack of use of appropriate and effective IS/IT evaluation methodologies in most organisations (Hitt and Brynjolfsson, 1996; Lin *et al.*, 2005). However, the complex and elusive nature of IS/IT has also meant that, even when using such methodologies, many IS/IT managers have found it difficult to evaluate their investments (Lin *et al.*, 2005; Love *et al.*, 2005). Difficulties also have been found in identifying and quantifying the costs and benefits, and in estimating the hidden, intangible and non-financial factors associated with IS/IT (Irani and Love, 2001). Evaluation is a highly complicated phenomenon which is often ignored or carried out inefficiently and ineffectively because IS/IT has evolved over time and has become more sophisticated (Serafeimidis, 2001; Fernandes and Vieira, 2015; Khorana *et al.,* 2015).

An IS/IT investment decision is sometimes made as an "act of faith" (Farbey *et al*., 1993; Deitz and Renkema, 1995) or a "gut instinct" (Powell, 1992; Katz, 1993) based on the intuition and instincts of the managers, without really understanding the true value of the IS/IT investments. This can be due to a lack of managers' knowledge and understanding of such appraisal techniques (Love *et al.*, 2006) and a lack of structure or framework for IS/IT evaluation (Money *et al.,* 2000; Irani and Love, 2001). This has become more complex because there are many techniques and methods available for IS/IT evaluation, with an apparent lack of consensus on what is most appropriate (Renkema and Berghout, 1997; Irani and Love, 2002). Having acknowledged the large and significant investment in IS/IT, together with the difficulties and inability to reap the expected results, it is crucial for organisations to pay extra attention to ensure they adopt an appropriate IS/IT evaluation methodology, so as to avoid an investment sinkhole and to achieve improved organisational IT performance (Irani *et al*., 2003; Love *et al*., 2005; Fernandes and Vieira, 2015).

2.2.3 IS/IT Investment Evaluation

The literature has widely explored the definition of IS/IT investment evaluation. Lin (2002) described evaluation as an assessment process using both quantitative and qualitative measures of the value of software and hardware deployment, resulting in

improved value of the information systems. Evaluation can be considered as a process of understanding the nature and complexity of IS/IT implementation (Symons and Walsham, 1988) and the assessment should be based on purpose, relevance and contribution of the IS/IT investment (Gunasekaran *et al*., 2008) from a holistic organisational perspective (Grover *et al*., 1998).

Evaluation is crucial for assessing the IS/IT investment and has been the key to successful implementation of IS/IT in many organisations (Irani *et al.*, 2002; Standing *et al*., 2006; Gunasekaran, 2008). It provides basic feedback to managers and improves the organisational learning process (Irani and Love, 2002) by highlighting best practices and lessons learnt for future IT investment. It is a strategic means to rationalise decision-making, to diagnose any problems, to propose appropriate planning, to reduce the uncertainty and to provide benchmarks, in order to ensure that the system is performing well and as planned (Lin and Pervan, 2001; Love *et al.*, 2005). Further, evaluation pertains to the identification and quantification of the costs and benefits of an IS/IT investment (Symons, 1994) and, therefore, aims to improve the operational efficiency of an organisation (Gunasekaran *et al.,* 2001).

Despite the significance of IS/IT evaluation, it has received limited attention from managers (Willcocks, 1992; Stockdale *et al*., 2006). Indeed, effective evaluation of IS/IT is a very difficult task to undertake because there are many uncertainties, due to the complex nature of the systems (Serafeimidis and Smithson, 1996; Chou *et al.*, 2006), and the large amounts of time, money and other resources allocated to it frequently deliver little value (Irani and Love, 2001; Irani *et al.*, 2001). Additionally, Love *et al.* (2005) highlighted the inhibiting factors of evaluation, including inadequate managerial and technological knowledge, absence of strategic vision, failure in identifying associated benefits, costs and risks, inadequate organisational resources, low acceptance level towards technology-related changes, wide range of methods used and inappropriate techniques adopted.

2.2.4 IS/IT Evaluation Approaches

A plethora of methods and techniques has been discussed in the literature to assist IS/IT investment evaluation. Comprehensive lists of such investment evaluation can be found in Farbey *et al.* (1994), Renkema and Berghout (1997), Irani (1998), Mills and Mercken (2004), and Jan *et al.* (2006). Serafeimidis (2002) described IS/IT investment evaluation as being commonly associated with the feasibility and the post-implementation phase. However, IT evaluation can be performed at any stage of development and implementation (Symons, 1991; Farbey *et al.,* 1992). It can be either prior to investment (predictive evaluation/*ex-ante*), during project delivery or after/post implementation (prescriptive evaluation/*ex-post*) of the project (Lin, 2002; Serafeimidis, 2002; Irani *et al.,* 2003).

Notably, organisations that undertake a rigorous use of IS/IT evaluation methodologies have higher perceived benefits from their investments (Tallon *et al.*, 2000; Irani and Love, 2002). For that reason, these methodologies should be developed to support organisational IS/IT planning and adoption (Gunasekaran *et al.*, 2008), with certain variables and measures, such as technical measures, financial measures, quality measures, user satisfaction and impact measures (Serafeimidis, 2002). However, there has been no single, ideal evaluation technique to cope with all circumstances because there are too many variables to be considered (Anandarajan and Wen 1999). Considering the technology alone is insufficient. Therefore, evaluation should also be concerned with the socio-technical aspects that include the technological, human and environmental elements of the project (Love *et al.*, 2006). According to Misra (2004), the selection of an evaluation methodology should be based on it being easily assessed, utilising objective criteria and fitting with the project objectives. Hence, evaluation of IS/IT should be straightforward to carry out and easily adapted to different contexts (Jones, 2008).

2.2.5 Predictive (*ex-ante*) and Prescriptive (*ex-post*) Evaluation

The predictive evaluation method, known variously as "*ex-ante*" (Money *et al.*, 2000), "formative" (Brown and Kiernan, 2001), or "prior operational use/POU" (Al-Yaseen *et al*., 2008), provides a forecast of the feasibility, costs and project impacts.

The overall purpose of predictive evaluation is to assess a strategy prior to commencing a project. It is used for investment decisions, comparison of values of different projects, development of evaluation criteria or measures and, ultimately, the establishment of commitment to the IS/IT investment (Farbey *et al.*, 1993; Walter and Spitta, 2004). Typically, predictive evaluation utilises financial/economic appraisal and other quantitative estimates such as payback, Net Present Value (NPV), or Internal Rate of Return (IRR) (Farbey *et al.*, 1993; Liu *et al.*, 2003). However, those approaches only provide estimates of tangible benefits and costs with no attention being paid to non-financial and intangible measures.

A frame of reference was introduced by Love and Irani (2002) to address the above issues, providing the taxonomy of appraisal that is shown in Figure 2.1. Further, evaluation criteria should be based on the strategies, goals and objectives of the organisation (Gunasekaran *et al.*, 2008). An *ex-ante* evaluation approach should, therefore, also encapsulate the analysis of cost-savings, productivity gains and competitive advantage, as well as the risks, of the IS/IT investment.

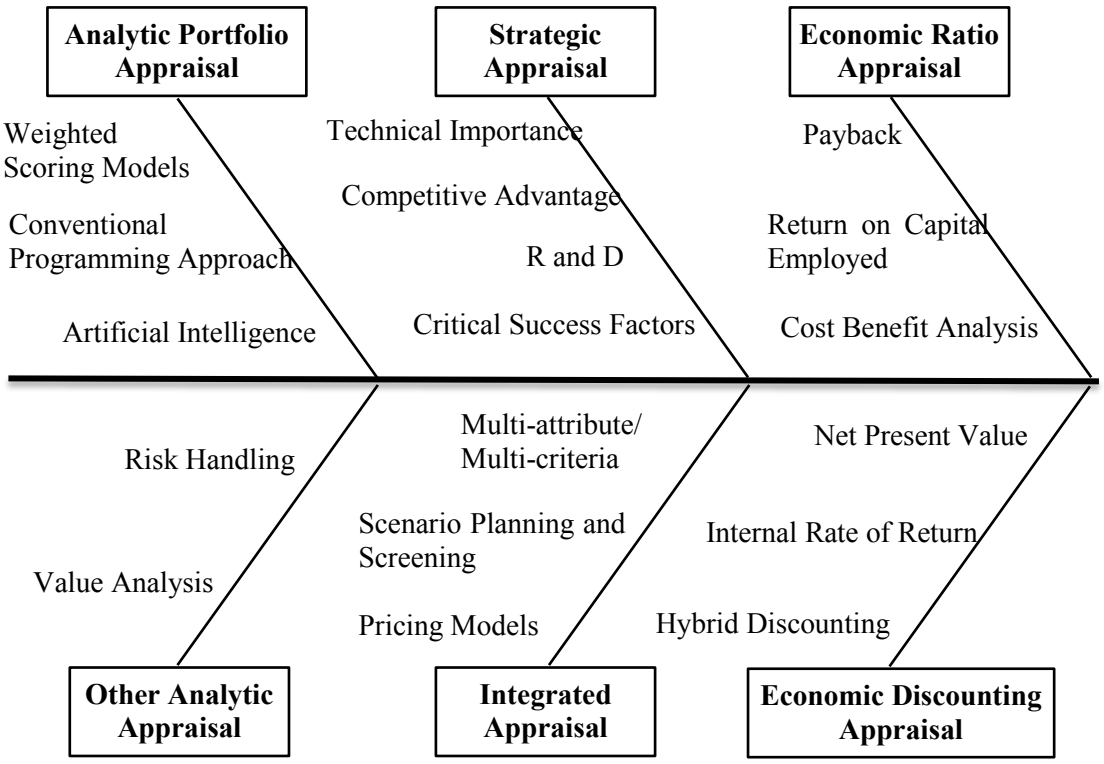

Figure 2.1 Taxonomy of Investment Appraisal Techniques (Source: Irani and Love, 2002: p. 6)

Conversely, prescriptive evaluations or ex-post evaluations are conducted after the project has been accomplished, in order to assess the performance level, the impacts and the lessons learnt from the IS/IT investment. They are carried out to provide a comparison of the costs and benefits between what was originally planned and its actual realisation and they aim to improve future processes (Farbey *et al.*, 1999). Further, Love and Irani (2004) postulated that ex-post evaluation would be value-adding through its contribution to organisational learning and the regeneration of knowledge about IS/IT projects. It can be used to assess the success or failure of IS/IT projects (Lin, 2002) as well as to provide feedback to organisations about the realised value from a project (Norris, 1996).

Irani (2002) and Kumar (1990), however, found evidence that ex-post evaluation is contradictory to the expected aim of improving the information system and system development practices. Kumar (1990) further criticised ex-post evaluation as being used primarily to disengage and close projects rather than for project improvement. Ex-post evaluation tends to be ritualistic rather than substantive (Jones, 2008). As a result, ex-post evaluation seems to be rarely carried out by organisations (Seddon *et al.*, 2002; Lin *et al.*, 2005). The rationale for this, according to Thomas *et al.* (2008), can be due to its low level of accountability, resource limitations, unclear measurement and lack of use of the results, which leads to a lack of support from management.

2.2.6 IS/IT Benefits Realisation/Management

As organisations continue to invest in IS/IT, there is also a greater demand for value from their investments (Farbey *et al.*, 1993; Sohal and Ng, 1998). However, organisations are still facing difficulties in evaluating their investments to ascertain the business value generated from those IS/IT projects. Measuring the value of an IS/IT investment has been one of the most crucial, but difficult, issues within many organisations (Money *et al.*, 2000; Irani *et al*., 2001; Serafeimidis, 2001). The value of IS/IT is determined from both the financial and non-financial impacts of its deployment (Berghout and Renkema, 2001). The impact can be positive or negative

and expected or unexpected (Peppard and Ward, 2004), with a positive impact referring to the benefits while the negative impact is associated with sacrifices or hardships. Further, the impacts can relate to the costs, risks, performance and/or criteria of the IS/IT implementation (Serafeimidis, 2001).

Organisations should design activities to measure, to evaluate and to manage those changes to determine whether the benefits from IS/IT implementation are eventually realised and delivered. Hence, attention should be given, not only to improving evaluation techniques, but also towards the realisation of benefits (Lin *et al.*, 2007). The rationale for this is that the evaluation provides justification for the investment, while managing the benefits provides the avenue to achieve and optimise the impact. Having acknowledged the importance of realising the benefits, organisations, practitioners and scholars have devised various methods and approaches commonly known as 'benefits realisation' or 'benefits management'.

There has been a surfeit of literature discussing benefits realisation, and various methodologies and approaches have been developed for realising the benefits from IS/IT. Benefits realisation can be viewed as an approach to managing the benefits evaluation to achieve benefit realisation of any IS/IT investment (Ward and Daniel, 2006; Alshawy *et al.*, 2007). It is comprised of management activities that optimise the benefits realised from business/organisational changes (Bradley, 2006). Lin and Pervan (2001) categorised the major purposes of IS/IT benefits management as surviving and operating as a business, refining business performance, increasing competitiveness and facilitating reflective learning of benefits realisation of other IS/IT investments. Benefits realisation, as Lin and Pervan (2001) suggest, should complement, and coincide with, the evaluation of investments to ensure successful IS/IT implementation within organisations. Benefits realisation, however, seems to be a neglected activity and is rarely conducted (Seddon *et al.*, 2002; Lin *et al.*, 2005; Thomas *et al.*, 2008). It has been noted to be a difficult, complex and challenging task for organisations to carry out (Lin *et al.*, 2007).

An effective benefits management process contributes to the satisfactory payoff from an IS/IT investment. There are many methodologies and approaches available, which include:

- Active Benefits Management (Leyton, 1995);
- The Cranfield Process Model of Benefits Management (Ward *et al.*, 1996);
- Active Benefit Realisation (ABR) (Remenyi and Sherwood-Smith, 1998);
- DMR's Benefit Realisation Model (Truax, 1997);
- The Benefit Realisation Approach (Thorp, 2003);
- Model of Benefits Identification (Changchit *et al.*, 1998);
- The IT Benefits Measurement Process (Jan *et al.*, 2006);
- Towards Best Practice to Benefits Management (Ashurst and Doherty, 2003);
- Benefits Realisation Management (Bradley, 2006); and
- Benefits Management in the Handbook of Programme Management (Reiss *et al.*, 2006).

Measuring the benefits, and the use of benefits management itself, however, is not the only important aspect of an IS/IT investment. In developing a deeper understanding of the evaluation, IS/IT projects should also consider the identification, measurement and control of cost and risk implications (Hochstrasser, 1990; Irani *et al*., 2001; Irani and Love, 2002; Love *et al.*, 2004). The inability of an organisation to identify, measure and manage the implications of the benefit, cost and risk aspects of IS/IT implementation can result in questioning the value of the investment (Irani *et al*., 2005) and can contribute to catastrophic impacts such as investment sinkholes, as well as jeopardising any potential competitive advantage (Irani *et al.*, 2003; Love *et al.*, 2005). Therefore, it is important to develop a balanced approach that enables managers to undergo evaluation that incorporates benefits realisation, a costs portfolio and management of risks (Anandarajan and Wen, 1999).

2.3 E-Procurement Adoption

2.3.1 Introduction

Procurement has been a key to success and a crucial part of any organisation's ability to conduct its activities effectively and efficiently (Leonard, 2000). According to Segev *et al*. (1998), procurement encompasses all activities involved in obtaining goods and services and managing their inflow into an organisation. The recent rapid developments of IS/IT have revolutionised the way organisations conduct their business in a dynamically and globally competitive environment. This has led to a profound change, leading to the adoption of an online business philosophy that is manifested in the form of e-procurement. Since most organisations spend at least one-third of their overall annual budget on the procurement of goods and services, e-procurement recently not only has become a strategic player in an organisation's value chain, but also has been the major driver for an extended supply chain (Hawking *et al*., 2004).

As the world's economy becomes more and more competitive, an organisation needs to sustain its competitiveness. There is a need to take full advantage of the potential benefits of adopting e-procurement within an organisation. There are a plethora of sources that address the various benefits of up-take of e-procurement, and a wide spectrum of e-procurement tools and applications exist that enable organisations to perform their procurement in an efficient and effective way. However, e-procurement adoption is not without risks and barriers, and results from many studies have shown a lower adoption rate of e-procurement than initially was predicted (Davila *et al.*, 2003). Other crucial issues are the costs associated with investment, deployment, operation, maintenance and further upgrading. Consequently, a clear conceptualisation of e-procurement concepts and variables must be determined before organisations 'jump' into adoption. Hence, the variables of benefit, cost, risk and critical success factors should be taken into consideration to derive optimal benefits from investment in e-procurement adoption.

Another issue that is central to e-procurement deployment is the assessment of the quality of the service achieved by e-procurement processes. Service quality is a key

determinant in differentiating service offerings and for building a competitive advantage (Gronroos *et al*., 2000; Bauer *et al*., 2005). E-procurement quality of service is positively associated with e-procurement system effectiveness (Croom and Johnston, 2003). Therefore, it is important to identify the quality of e-procurement dimensions in order to enable e-procurement to achieve customer satisfaction and competitiveness.

2.3.2 E-Procurement Definition

Definitions of e-procurement vary across literature in the field, both in scope and depth. A review of the normative literature reveals that there is no universal definition of e-procurement (Murray, 2001; Vaidya *et al.*, 2004). As a result, e-procurement has become a topic of discussion (Grieger, 2003), within the context of both the private and public sectors (Panayiotou *et al.*, 2004). A list of definitions from various sources can be seen in Table 2.1. A further comprehensive definition of e-procurement is provided in Appendix A.

Table 2.1 E-Procurement Definitions from the Literature

Reference	E-Procurement Definition
Minahan and Degan (2001)	The use of web-based technologies to support a supply chain network.
Davila *et al*. (2003)	The use of the internet for procurement activities.
Croom and Brandon-Jones (2004)	The use of Internet-based communication technologies (ICTs) to perform the procurement process including searching, sourcing, negotiation, ordering, receipting and post-purchase reviewing.
Vaidya *et al.* (2004)	"The use of electronic technologies to streamline and enable the procurement activities of an organisation".
Dooley and Purchase (2006)	"The use of online technology to assist with the procurement function".
Gunasekaran and Ngai (2008)	A comprehensive process utilising information technology (IT) systems to develop agreements for the acquisition of goods or services.
Teo *et al.* (2009)	The streamlining of purchasing processes into online-based purchasing.
Farzin and Neshad (2010)	"Conducting business on purchase and sale of supplies, work and services through the Internet as well as other information and networking systems".

In general, e-procurement is a comprehensive process of obtaining materials and services using the application of IS/IT and managing the inflow into the organisation (Subramaniam and Shaw, 2002; Gunasekaran and Ngai, 2008). It is used as a means by which to improve efficiency, particularly by reducing all costs in procurement, and to enhance collaborative relationships with suppliers (Croom, 2000; MacManus, 2002; Hsiao and Teo, 2005).

Based on the commonalities and cohesion evident from a review of the literature, the following operational definition will be used in this research:

> *E-procurement is the use of "Information Communication Technology (ICT)" and associated applications to support procurement processes within an organisation.*

As rapid changes occur within IS/IT, e-procurement processes also are evolving rapidly. From the literature, various forms, tools, functionalities and applications of e-procurement have been widely used and acknowledged (Puschmann and Alt, 2005; Farzin and Nezhad, 2010). General e-procurement activities can be divided into the collection of information, relationships with suppliers, contracting, requisitioning and analysis (Presutti, 2003; Mora-Monge, *et al.*, 2010). To gain a deeper understanding of e-procurement, the next section discusses the identification of benefits, costs, risks and success factors of e-procurement adoption.

2.4 E-Procurement Benefits, Costs, Risks and Critical Success Factors

Having acknowledged the significant investment require for e-procurement adoption, the investigation of the costs, benefits, risks and success factors is crucial to assist the evaluation of e-procurement investments in many organisations. In the literature, the costs, benefits, risks and critical success factors have been widely explored and an extensive base of cases also are available as references. A framework of e-procurement adoption will be developed, based on the review of the literature. A better understanding of costs, benefits, risks and critical success factors will provide an avenue for an organisation to evaluate their e-procurement initiative, leading to

successful and effective e-procurement adoption. Hence, it is expected that organisations will be able to prepare better for e-procurement adoption.

2.4.1 E-Procurement Benefits

E-procurement has attracted the attention of managers and decision-makers because it is perceived as having the potential to return great value through its adoption (Subramaniam and Shaw, 2002; Presutti, 2003; Gunasekaran *et al*., 2009). The value of e-procurement can be seen as making a positive impact through the benefits achieved by its adoption. There is a myriad of literature espousing the benefits and the drivers of e-procurement. This section provides a brief review of the benefits and the drivers behind the success and rapid growth of e-procurement in business practices.

The review of the literature that has been undertaken highlighted that e-procurement offers a range of various benefits and the positive trend in its adoption implies its enormous benefits to organisations. Minahan and Degan (2001), for instance, have identified many benefits that include savings in cost (administration, operation and inventory) and time, improvements in contract compliance, enhanced market data, improved relationships with (and responsiveness to) partners/stakeholders and increased efficiency, efficacy and accuracy of production. Along a similar line, Kalakota and Robinson (2001) proposed the consequence of improved efficiency and effectiveness. Davila *et al*. (2003), in their study, revealed common benefits, namely: reduced transaction costs, improved order time, increased suppliers, faster purchasing cycle time and reduced payments for purchasing goods.

A large number of studies on e-procurement adoption, from different countries and regions, also have revealed significant benefits of the system. Hawking *et al.* (2001) described a list of benefits as drivers for general e-procurement solutions in Australia. Meanwhile, Eadie *et al.* conducted research on e-procurement in Northern Ireland (2007) and the United Kingdom, or UK, (2010). Other studies have been undertaken in Taiwan (Liao *et al.*, 2003), Slovenia (Podlogar, 2007), Malaysia (Yussof *et al.*, 2011), Singapore (Kheng and Al Hawamdeh, 2002), the United States

of America (USA) (Davila *et al*., 2003), Germany (Wirtz *et al.*, 2010), Hong Kong (Gunasekaran and Ngai, 2008), Greece (Tatsis *et al.*, 2006), and many more places. Against this backdrop, Subramanian and Shaw (2001), however, revealed a lack of evidence for the realisation of e-procurement benefits. Besides, many studies also have shown that there has been no clear evidence of positive impacts resulting in a lack of motivation for organisations to adopt it (Gebauer *et al.*, 1998, Davila *et al.*, 2003, Liao *et al.*, 2003, Egbu *et al.*, 2004, Hawking *et al*., 2004).

From the literature, e-procurement benefits can be classified, based on their characteristics, into tangible and intangible benefits (Gunasekaran *et al.*, 2001; Irani and Love, 2002; Dai and Kauffman, 2004; Panayiotou *et al.*, 2004; Ronchi *et al*., 2010) and financial and non-financial benefits (Irani and Love 2002). Tangible (quantitative) benefits are the quantitatively measured impacts of e-procurement, prominent as financial measures that cover reduction in costs and saving of time. Intangible (qualitative) benefits consist of process improvements and organisational benefits, which cannot be readily converted into financial terms. Process improvements include simplification of ordering, less paperwork, reduced redundancy, cutting back on bureaucracy, standardisation of processes and documents, online reporting, transparency in processes, legal aspects of compliance, error reduction and higher accessibility of information. Meanwhile, organisational benefits refer to autonomy via decentralisation of procurement, improved competition, improved communication and partnerships with suppliers.

More importantly, the benefits can be identified according to three categories based on their importance: strategic, operational or tactical (Croom, 2000; Attaran, 2001; Kalakota and Robinson, 2001; De Boer *et al.*, 2002; Love *et al.*, 2005; Piotrowicz and Irani, 2010; Panwar and Srivastava, 2014; Rahim and Kurnia, 2014). In the light of a study by Piotrowicz and Irani (2010), the combination of classifications will be utilised in this study to provide a clear picture of the multidimensional impact of e-procurement. Building the framework for the evaluation of e-procurement, its benefits will be categorised as:

1. Strategic benefits. These are intangible and non-financial (Irani and Love, 2001) so cannot be immediately quantified. They relate to organisational change, comparative efficiency and competitive/market advantages (Attaran, 2001). The term also implies greater control and influence over the total supply base and expenditure.
2. Operational benefits. These are the benefits that emerge directly from processes, activities or functionalities that are quantifiable. They are characterised as tangible and non-financial (Irani and Love, 2001). This concerns the effectiveness and efficiency of transactional/purchasing activities and improved auditing of each transaction process.
3. Tactical benefits. Tactical benefits are the benefits resulting from specific processes or within a department in which the impact can be determined directly. This includes improved and explored relationships, support for decision-making and timely communication.

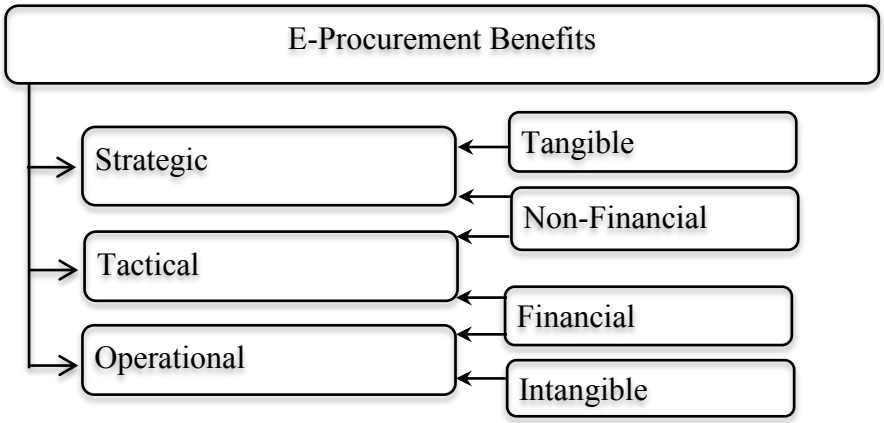

Figure 2.2 Taxonomy of Benefits

Finally, a list of benefits has been synthesised from the literature, as shown in Table 2.2. For the purpose of this study, the benefits identified will be one of the main themes of the e-procurement adoption evaluation framework and will be analysed further.

Table 2.2 Strategic, Operational, and Tactical Benefits of E-Procurement Identified from the Literature

Category	Identified Benefits From Literature	Intangible	Tangible	Financial	Non-financial	Reference
Strategic	Enhanced competitive advantage	√			√	Croom, (2000), Attaran (2001), Mukhopadhyay and Kekre (2002), Hawking *et al.* (2004), Gunasekaran (2005), Piotrowicz and Irani (2010), Ronchi *et al.* (2010), Johnson (2011), Barahona *et al.* (2015), Neupane *et al.* (2015).
	Reduced administrative hours	√			√	
	Improved organisational and process flexibility	√			√	
	Support for organisational growth	√			√	
	Increased customer service	√			√	
	Improved relationship with partners	√			√	
	Improved cooperation and communication with stakeholders	√			√	
	Fraud prevention	√			√	
	Access to wider scope of partners	√			√	
	Promotion of transparency and accountability	√			√	
Operational	Generation of savings and reduced costs		√	√		Attaran, 2001; Croom and Johnston, 2003; Bartezzaghi and Ronchi, 2004; Hawking *et al.,* 2004; ; Tatsis *et al.,* 2006; Piotrowicz and Irani, 2010; Johnson, 2011, Khorana *et al*. (2015), Yu *et al*. (2015).
	Offer of security and confidentiality	√			√	
	Time saving/shortened delivery time/reduced lead time		√	√		
	Elimination of zone and time barriers		√	√		
	Efficient and effective procurement processing	√			√	
	Improved ease of access to information	√			√	
	Productivity improvement		√	√		
	Customer service improvement	√			√	
	Quality improvement	√			√	
Tactical	Process transparency and fair competition	√			√	Attaran (2001), Love *et al.* (2004), Carayannis and Popescu (2005), Piotrowicz and Irani (2010), Neupane *et al.* (2012), Yu *et al*. (2015)
	Improved monitoring and control	√		√		
	Provision of better information about suppliers					
	Improved staff transferability		√	√		
	Standardisation of documents and processes		√		√	
	Effective mechanisms to curb fraud, waste, abuse and corruption	√			√	
	Driving force for IT penetration in the public sector	√			√	
	Improved administration in procurement	√			√	

2.4.2 E-Procurement Costs

E-procurement investments are complex, time-consuming and costly to implement, so organisations should be aware of the significant costs associated with its adoption (OGC, 2002; Hawking *et al.*, 2004; Gunasekaran and Ngai, 2008; Wirtz *et al.*, 2009) and understand that the costs may outweigh the benefits of adopting it as a solution (Egbu *et al.*, 2004). While it is advocated (Davila *et al.*, 2003) that companies should carefully weigh the benefits and costs of a system, it is difficult to estimate the costs of a whole e-procurement system (Rajkumar, 2001), because the nature of e-procurement and the technology that supports it evolve over time. The need to manage and monitor costs effectively is, therefore, paramount to success (Tatsis *et al.*, 2006; William and Hardy, 2007) because organisations that do not have clear visibility on their costs versus benefits are unlikely to invest and to succeed in e-procurement (Subramaniam and Shaw, 2002; Davila *et al*., 2003; Tonkin, 2003; Hawking *et al*., 2004).

The first step towards managing costs is to identify the types of costs associated with e-procurement adoption. There is a wide range of literature on cost classifications associated with e-procurement. Koorn *et al.* (2001), for example, classified these costs into the 10 categories of: hardware, marketplace participation, implementation, system integration and transition, licensing/legal costs, training costs, supplier assistance, process re-engineering, administration and the costs of operations and management. Such a breakdown can be used to manage costs during adoption; however, there is no standard approach to breaking down these costs. In fact, during the same time period, Smeltzer and Carter (2001) categorised e-procurement costs as: Administrative (including processing, invoicing and material handling); Usage (including product design, lifecycle and standardisation); and Purchase price (including bundling, supplier cost structure and volume leverage). In addition, Lu (2001) broke costs down into eight core factors: expense of setting up applications; maintaining applications; internet connection; hardware/software; security concerns; legal issues; training; and rapid technology changes.

While many different views of cost classification exist, one of the most cited and arguably the most useful is in the works on direct and indirect costs of IT projects

(Irani *et al.*, 2001; Love *et al.*, 2005). This is a generic and comprehensive classification, derived from many studies on IT costs, which has been applied in several different contexts, including e-procurement (Irani *et al.*, 2006). A list of this cost taxonomy, and the underlying sources, has been synthesised in Table 2.3.

Table 2.3 Taxonomy of E-Procurement Costs from the Literature

Type of Cost	Description	Reference
Direct	Infrastructure investment cost	Koorn *et al.* (2001), Vaidya *et al*. (2004), Irani *et al.* (2006), Fernandes and Vieira (2015).
	Hardware/software	De Boer *et al.* (2001), Hawking *et al.* (2004), Irani *et al.* (2006), Podlogar (2007), Fernandes and Vieira (2015).
	Server and internet connection	Bartezzaghi and Ronchi (2003), Podlogar (2007), Khorana *et al.* (2015).
	Operational and maintenance	Lu (2001), Irani *et al.* (2006), Khorana *et al.* (2015).
	System development	Anandarajan and Wen (1999), Lu (2001), Irani *et al.* (2006), Fernandes and Vieira (2015).
	Consultancy support	Leipold *et al.* (2004), Stockdale and Standing (2004).;
	Training and human resource development	De Boer *et al*. (2002), Vaidya *et al*. (2004), Gunasekaran and Ngai (2008), Hassan (2013), Suliantoro *et al.* (2015).
	Rewards, incentives and salary schemes	Fu *et al.* (2004), Kothari *et al*. (2005), Hassan (2013).
Indirect	Partnership costs	Vaidya *et al*. (2004), Gunasekaran and Ngai (2008), Gunasekaran *et al.* (2009), Nasir Uddin (2015).
	Strains on resources	Liao *et al.* (2003), Subramaniam and Shaw (2004), Vaidya *et al*. (2004).
	Staff motivation	Subramaniam and Shaw (2004), Vaidya *et al*. (2004), Gunasekaran and Ngai (2008).
	Social costs	Irani *et al.* (2006), Aboelmaged (2010), Walker and Brammer (2012).
	Organisational changes	Vaidya *et al*. (2004); Hardy and Williams (2008), Teo *et al.* (2009), Farzin and Nezhad (2010), Stephens and Valverde (2013).

The break-down of costs into direct (easily measurable and controlled) and indirect (hard to measure or control) provides a strategy for organisations to identify and justify the total cost of adoption, including estimates for all hidden (indirect) costs. Although the cost of e-procurement adoption may be relatively high, the literature shows that the ongoing e-procurement costs are much lower compared to traditional procurement methods (Croom and Jones, 2007; Teo *et al.*, 2009).

Having acknowledged the types of costs associated with e-procurement, it is necessary to identify strategies to measure and control these costs to ensure successful adoption. These can then, alongside the benefits, be incorporated into organisational evaluation processes of e-procurement adoption. One significant strategy for costs-and-benefits realisation management is the identification and management of risks associated with e-procurement. These are discussed in the next section.

2.4.3 E-Procurement Risks

According to McFarlan (1981) and Willcocks and Margetts (1994), anything that contributes to the uncertainty of an IS/IT investment can constitute a risk. E-procurement risks, therefore, can be defined as any threat that has the potential to prevent organisations from meeting their procurement objectives, and previous studies have identified that e-procurement adoption, like the adoption of many other IT systems, is subject to high risk (Nicolaou and McKnight, 2006; Kusuma and Pramunita, 2011, Nasir Uddin, 2015). It is, therefore, important to identify the risks of e-procurement from its initial early development through to the mature stages of the adoption project because managing the uncertainty associated with this risk is a key factor of e-procurement's success (Bensaou and Venkatraman, 1995; Premkumar *et al*., 2005, Rita and Krapfe, 2015; Salonen, 2015).

The first step in managing those risks is to identify and classify the risks so that they can be used to develop a risk management strategy. Numerous studies have examined e-procurement risks. Davila *et al.* (2003), for example, identified four categories of risk: internal business risks, external business risks, technological risks

and process risks. A different perspective from a review on e-procurement adoption within China (Chang *et al.*, 2008) categorises four types of uncertainty:

1. Environmental uncertainty refers to the complexity and the frequency of change within the environment (Premkumar *et al*., 2005; Kwablah, 2015);
2. Partnership uncertainty relates to future partner behaviour (Bensaou and Venkatraman, 1995; Gurakar and Onur Tas, 2015), partnership operations and partner opportunism (Clemons and Row, 1992);
3. Process uncertainty refers to the likelihood of making errors during transaction processes (Subramaniam and Shaw, 2004; Salonen, 2015);
4. Organisational knowledge uncertainty is related to technical and managerial skills and the know-how of organisations (Yu *et al*., 2003; Khorana *et al.*, 2015; Ronald and Omwenga, 2015).

While there are many variants on classification, a common theme is a breakdown of risk based on the source of the risk (i.e. internal vs. external). Internal risks are those risks emerging from the technological, organisational and people elements of e-procurement, whereas external risks are derived from external partnerships and the surrounding environment. A list of risks derived from the literature are shown in Table 2.4.

Table 2.4 Risks of E-Procurement from the Literature

Taxonomy	Risk	Process	Organisational knowledge	Environmental	Partnership	Reference
Internal	Process risks	√				Davila *et al.* (2003), Galloway and Jamieson (2003), Subramaniam and Shaw (2003), Chang *et al.* (2008), Nasir Uddin (2015).
	Organisational knowledge risks: • Leadership and staff risk • Organisational change risk • Managerial and staff turnover risk		√			Giunipero and Eltantawy (2004), Baccarini *et al.* (2004), Love *et al.* (2005), Chang *et al.* (2008), Sukumar and Edgar (2009), Kwablah (2016).
	Technological risk: • Technical complexity risk • Compatibility and adaptability of application • Technological infrastructure risk • Internet and server risk	√				Koorn *et al.* (2001), Kheng and Al-Hawamdeh (2002), Davila *et al.* (2003), Baccarini *et al.* (2004), Giunipero and Eltantawy (2004), Vaidya *et al.* (2004), Love *et al.* (2005), Ratnasingam (2007), Nasir Uddin (2015).
	Security risk: • Authentication risk • Data security risk	√				Saeed and Leith (2001), Kheng and Al-Hawamdeh (2002), Kauffman and Mohtadi (2004), Sukumar and Edgar (2009), Kwablah, (2016), Nasir Uddin (2015).
	Transaction risk: • Moral hazard risk • Legal risk • Adverse selection risk • Repudiation risk • Post contractual		√			Han and Noh (2000), Schroder and Yin (2000), Koorn *et al.* (2001), Galloway and Jamieson (2003), Sukumar and Edgar (2009), Nasir Uddin

	performance risk • Post contractual conflict risk					(2015).
	Privacy risk: • Information visibility risk • Inappropriate use of information risk	√				Han and Noh (2000), Schroder and Yin (2000), Saeed and Leith (2001), Koorn *et al.* (2001), Kwablah (2016).
	Implementation/adoption risk: • Transition/integration risk • Uncertainty of accepted standard • Operation and maintenance risk	√				Viehland (2001), Ratnasingam (2007), Angeles and Nath (2007), Panda and Sahu (2012), Stephens and Valverde (2013), Nasir Uddin (2015).
External	Partnership risk, including: • Partner readiness risk • Partner behaviour risk • Operation/ synchronisation risk • Customer expectation/ trust risk • Outsourcing/ dependency risk				√	McNamee and Chan (2001), Viehland, (2001), Baccarini *et al.* (2004), Vaidya *et al.* (2004), Sukumar and Edgar (2009), Gurakar and Onur Tas (2015).
	Environment risk: • Competitive risk • Political risk • Laws and regulations risk • Cultural risk			√		Viehland (2001), Kheng and Al-Hawamdeh (2002), Chang *et al.* (2008), Sukumar and Edgar (2009) Kwablah (2016).
	Economic/financial risk: • Increased cost risk • Pricing pressure risk			√		Giunipero and Eltantawy (2004) Kauffman and Mohtadi (2004) Ratnasingam (2007).

Based on the above, it is clear that benefits, costs and risks are all key factors in determining the likely success of e-procurement adoption. However, these cannot be considered in isolation from the overall objectives of the project. In order to measure the success of adoption, it is necessary to identify and monitor the 'critical success factors' that can contribute to meeting the objectives of the project. The next section

provides a comprehensive overview of critical success factors associated with e-procurement adoption.

2.4.4 Critical Success Factors

Organisations need to gain better understanding of important factors that lead to successful adoption of e-procurement. By acknowledging such factors, organisations will be able to better prepare their e-procurement plan to obtain the optimum benefits from the technological solution, leading to improvement in their competitiveness in the global market (Vaidya *et al.*, 2006; Podlogar, 2007, Khorana *et al*., 2015). Identification of critical success factors enables the assessment of the performance and progress of e-procurement deployment. This section presents the critical factors obtained from best practices and lessons learned from previous experiences and the literature.

In their study on the success factors and challenges of B2B e-procurement adoption, Angeles and Nath (2007) revealed three factors, which were: supplier and contract management; end user behaviour and business processes; and information and infrastructure. These were keys to the success of the initiative. Gardenal (2010) analysed the success factors from the contexts of People-Process-Technology in defining, assessing and optimising the benefits of e-procurement uptake. The 'People' context includes sharing knowledge, networking and training. 'Process' refers to re-engineering the process and the establishment of a standard documentation and coding system, while 'Technology' focuses on the website platform, system integration, system security and authentication via digital signatures.

While there is no common view of how success factors should be classified, it is possible to broadly categorise the identified items into organisational, technological and environmental factors (Chan, 2002; Vaidya *et al.*, 2006; Chong and Pervan, 2007; Teo *et al.*, 2009; Hassan *et al*., 2010, Li *et al*., 2015). The technological factor is associated with the use of technologies that are relevant to e-procurement adoption, which includes the existing technologies and all new technologies

available. The organisational factor includes the characteristics and the structure of the organisation as well as the resources available within the organisation to support the adoption of e-procurement. The environmental factor refers to the setting in which the organisation adopts e-procurement, which includes the relationships with partners and the existing regulatory environment. A list of success factors from the literature can be broken down, as shown in Table 2.5.

Table 2.5 E-Procurement Critical Success Factors (CSFs) from the Literature

Factors	Description	Reference
1. Technological Factors		
Infrastructure investment	Adequate infrastructure to support the system	Vaidya *et al*. (2006), Croom and Brandon-Jones (2007), Gunasekaran *et al.* (2009), Fernandes and Vieira (2015), Khorana *et al.* (2015).
System integration	Inter-operability and integration of the system to existing hardware, software, networking and IS infrastructure	Davila *et al.* (2003)*;* Puschmann and Alt (2005), Farzin and Nezhad (2010), Kwablah (2015), Salonen (2015), Yu *et al*. (2015).
Technology and system development	Development of technology and systems that support e-procurement tasks	Chan (2002), Chang *et al.* (2004), Croom and Brandon-Jones (2007), Dorasamy (2012), Fernandes and Vieira (2015), Khorana *et al.* (2015).
Ease of use	A user-friendly system	Chan and Swatman (1999), Eakin (2003), Davila *et al.* (2003), Panayiotou *et al.* (2004) Kaliannan *et al.* (2009), Aboelmaged (2010), Ibem and Laryea (2015), Li *et al*. (2015).
Security and authentication	Security of data and transactions is critical in developing confidence and trust towards the system.	Davila *et al.* (2003), Vaidya *et al*. (2006), Angeles and Nath (2007), Gunasekaran and Ngai (2008), Dorasamy (2013), Milovanović *et al.* (2012), Khorana *et al.* (2015), Kwablah (2015), Nasir Uddin (2015).
Technological standard	Implementation and maintenance of standards/rules governing e-procurement	Davila *et al.* (2003), Puschmann and Alt (2005), Angeles and Nath (2007), Gunasekaran and Ngai (2008), Dorasamy (2012), Kwablah (2015), Nasir Uddin (2015).
2. Organisational Factors		
Organisation size	Larger firms that have more resources and bigger transactions tend to adopt the technology more rapidly than smaller firms.	Min and Galle (2001), Hawking *et al*. (2004), Moon (2005), Angeles and Nath (2007), Teo *et al.* (2009), Gupta and Narain (2015), Yu *et al.* (2015).

Support from top management	Commitment from top management in adopting the system is crucial to support its adoption.	Leipold *et al.* (2004), Vaidya *et al.* (2004), Dooley and Purchase (2006), Gunasekaran and Ngai, (2008), Kwablah (2015), Li *et al*. (2015).
Information-sharing culture	Organisations will potentially benefit from information sharing for mutual performance gains.	Davila *et al.* (2003), Croom and Brandon-Jones (2007), Teo *et al.* (2009), Li *et al*. (2015).
Performance measurement	Development of a measurement system for procurement performance: goals and targets, definition of Key Performance Indicators (KPIs) and progress monitoring	Panayioutou *et al.* (2004), Puschmann and Alt (2005), Vaidya *et al.* (2006), Farzin and Nezhad (2010), Rita and Krapfel (2015), Yu *et al*. (2015).
Process re-engineering	Re-engineering throughout procurement process includes subsequent modification of organisational structure, staff/human behaviour and partnerships to create value-added processes.	Panayioutou *et al.* (2004), Vaidya *et al.* (2006), Angeles and Nath (2007), Gunasekaran and Ngai (2008), Farzin and Nezhad (2010), Fernandes and Vieira (2015), Kwablah (2015).
Human resource development and training	Development of human resources by extensive training is also critical to maximise the use of the systems and to gain optimum benefits.	Kheng and Al-Hawamdeh (2002), Croom and Brandon-Jones (2005), Vaidya *et al.,* (2006), Gunasekaran and Ngai (2008), Kwablah (2015), Nasir Uddin (2015).
Organisational structure and culture	Changes in organisational structure into a leaner and more flexible structure to support the adoption, as well as cultural acceptance of the system	Neef (2001), Teo and Ranganathan (2004), Vaidya, Sajeev and Callender (2006), Gunasekaran and Ngai (2008), Panda and Sahu (2012), Kivlik and Bakland (2015).
3. Environmental/External Factors		
Partnership	Managing relationships with trading partners improves trust and confidence, leading to a higher extent of e-procurement adoption.	Chan (2002), Davila *et al.* (2003), Teo and Ranganathan (2004), Vaidya *et al.* (2006), Angeles and Nath (2007), Teo *et al.* (2009), Li *et al*. (2015).
User/ stakeholder uptake/ involvement	Involvement of stakeholders from the beginning of the adoption to obtain their support in adopting the system	Rajkumar (2001), Presutti (2003), Gebauer and Shaw (2004), Panayioutou *et al.* (2004), Vaidya *et al.* (2006), Dorasamy (2012), Kwablah

		(2015).
Regulatory and legal aspects	The extent to which fast adoption can be supported with an adequate legal framework governing e-procurement	Hawking *et al.* (2004), Panayiotou *et al.* (2004), Moon (2005), Angeles and Nath (2007), Gunasekaran *et al.* (2009), Li *et al*. (2015).
Coordination and communication between stakeholders	Effective communication and coordination improve awareness and influence behavioural intentions of the system's use.	Subramaniam and Shaw (2002), Kauffman and Mohtadi (2004), Vaidya *et al.* (2006), Teo *et al.* (2009), Li *et al*. (2015).
Support from central government	Support from higher levels of government entities on funding and legal aspects	Fu *et al*. (2004), Gunasekaran *et al.* (2009), Neupane *et al.* (2012), Dorasamy (2012), Hidayat (2015).

2.5 E-Procurement Impact on Quality and Performance

Throughout the intense evolvement of e-procurement, one of the critical dimensions for every manager is assessment of the impact of adopting the e-procurement on his/her organisation. The nature of the field still gives rise to many questions and leads managers frequently to wonder whether to 'jump', keep watching or just not bother at all. Hence, there is a need to measure the performance and quality of any e-procurement adoption (Vaidya *et al.* 2004). There have been many methods used to assess the performance of procurement systems, for example, the Balance Score Card (Kaplan and Norton, 1996), Economic Value Analysis (EVA) and activity-based costing. A study by Croom and Brandon-Jones (2007) examined the impact of e-procurement implementation and operation on organisational processes and performance in the UK public sector. They disclosed that the method of e-procurement implementation contributed an impact on governance structures, organisational characteristics and the total costs of its acquisition.

McManus (2002) suggested the use of financial and economic measures to assess the impact of e-procurement adoption. The identification of financial impact is important to meet user perceptions and compliance (Croom, 2000; Croom and Johnston, 2003; Reunis and Van Raaij, 2006; Raaij *et al.*, 2007). Several studies have introduced the measurement of e-procurement quality in order to improve e-procurement compliance (Raaij *et al.*, 2007; Brandon-Jones, 2009). However, there has been no

single research instrument that has comprehensively encompassed all the impacts of e-procurement initiatives. Many studies on e-procurement impact are based on conceptual analyses and case studies, resulting in a lack of broad empirical evidence (Davila *et al.*, 2003; Brandon-Jones and Croom, 2005). Thus, the design of an effective measurement tool is central to better understand the impact of e-procurement (Madeja and Schoder, 2003; Teo and Lai, 2009). The measurement of e-procurement quality will be discussed in the next chapter.

2.6 E-Procurement Adoption in the Indonesian Public Sector

E-procurement has been at the forefront of procurement reform worldwide (Hardy and Williams, 2008; Neupane *et al*., 2012; Vaidya & Campbell, 2014). Traditional purchasing involves a huge number of processes, and IT usage has the potential to simplify these processes, resulting in more efficient and effective procurement (Gebauer *et al*., 1998; Turban *et al.*, 2006; Wu *et al*., 2007; Teo *et al*., 2009). There is clear evidence that e-procurement offers a wide range of benefits for both public and private sectors (Neef, 2001; Roth, 2001; Presutti, 2003; Moe, 2004; Panayiotou *et al.*, 2004; Carayannis and Popescu, 2005; Moon, 2005; Puschmann and Alt, 2005) and, as a consequence, many government organisations have adopted e-procurement in recent years (Coulthard and Castleman, 2001; Hawking *et al*., 2004; Vaidya & Campbell, 2014).

Recognising the potential benefits, in 2003, the Indonesian government elected to move towards e-procurement adoption as mandated in the Presidential Decree Number 80 (2003) on Guidelines for Procurement of Goods/Services. The main drivers for the initiative were predominantly associated with good governance through improvements in accountability, transparency, efficiency and effectiveness in the public procurement of goods/services. This section discusses the adoption of e-procurement in the public sector context and covers the background, legal aspects and practices within the Indonesian public sector.

2.6.1 Public Procurement

Public procurement can be viewed as the public consumption of acquisitions that consist of goods and services by government or public sector organisations (Weiss,

1993; Essig and Arnold, 2001; Uyarra and Flanagan, 2010). Public procurement is one of the most crucial activities for government and public organisations (Thai, 2001; Somasundaram and Damsgaard, 2005) and accounts for a significant proportion of spending in many countries. The World Bank (2003) estimated expenditure on public procurement to be about 6-10% of a country's Gross Domestic Product (GDP). For developing countries the percentage is higher, with Nicol (2003) estimating it to be around 15% of GDP, and Wahid (2009) claiming that it may even account for 70% in some government organisations.

As well as satisfying the requirements for goods, works, systems and services in a timely manner (Vaidya *et al*., 2005; Vaidya *et al*., 2006), public procurement also has to meet the basic principles of good governance: transparency, accountability and integrity (Callender and Schapper, 2003; Wittig, 2003). In general, the goal of procurement is to make purchasing decisions more effective and efficient in order to provide the best value for money (Callender and Matthews, 2002; Thai and Piga, 2007). Raymond (2008) identified the key principles that underpin public procurement as:

- Value for money. This refers to the best return and performance for the money being spent (Bauld and McGuinness, 2006; Walker and Brammer, 2012, Piotrowicz and Irani, 2010; Johnson, 2011);
- Ethics. A high standard of ethical conduct in public procurement is crucial. Having inadequate ethics may lead to serious consequences such as breaches of codes of conduct (Atkinson, 2003; Neupane, Soar and Vaidya, 2014; Shakya, 2015);
- Competition. Increasing competition in procurement significantly influences quality improvement and price reduction,as well as enhancing competitiveness among suppliers (Khorana, Ferguson-Boucher and Kerr, 2015);
- Transparency. Transparency can be viewed as openness that may improve accountability and curb corruption practices in procurement. It has been the core of good governance values (Wittig, 2003; Transparency International, 2013);
- Accountability. As public procurement entails public money, it must be accountable for all money spent (Rasheed, 2004; Gunasekaran and Ngai, 2005;

Varney, 2011).

2.6.2 Public vs Private Procurement

Although there are many similarities between public procurement and private procurement, many differences are well acknowledged (Thai, 2001; Thai, 2004). Despite both private and public procurement being driven by providing the supplies at the best value within the desired range of quality, quantity and time requirements, public procurement is more complex and deals with a broader range of issues than private procurement (Leukel and Maniatopoulos, 2005; Thai, 2008). Public procurement is highly regulated and characterised by a bureaucratic procedure; accordingly, laws, policies and standards are more widely employed, compared to private procurement (Henriksen and Mahnke, 2005). There are also differences in the attitudes (Covington, 1996) and the relationships (Wang and Bunn, 2004) of stakeholders involved in public and private procurement. In terms of the diversity of customers served and their requirements, public procurement is much more extensive than private procurement (Erridge and Callender, 2005). Hinson (1999) and Thai (2015) exhibited the comparison between public procurement and private procurement as presented in Table 2.6.

Table 2.6 Comparison Between Private Procurement and Public Procurement

Private Procurement	Public Procurement
Informal process	Formal Process
Closed supplier selection process	Open selection
Not subject to open records	Legal access to documents
Loosely structured process	Bureaucratic hierarchy and processes
Profit oriented	Focus on public interest
Cost and service are award-based	Award selection considers cost more than service
Requires long-term supplier partnership	Competition based on supplier selection

2.6.3 Public E-Procurement: A Perspective

The existence of IS/IT has transformed the way governments perform procurement of goods and services for the public by using an electronic platform (Tonkin, 2002; Moe, 2004). While it is generally recognised that most public sector agencies have

been slow to implement the latest technology to improve their services to the public (Kierkegaard, 2006; Padhi and Mohapatra, 2011), more recently, a growing number of public sector organisations have started to adopt the latest purchasing models using e-procurement. Mirroring the successful e-procurement uptake in the private sector, the decision-makers have begun to realise and understand the significance of e-procurement within the public context (MacManus, 2002; Panayiotou *et al.*, 2004; Croom and Brandon-Jones, 2005; Fernandes and Vieira, 2015). E-procurement has become a priority in the political agenda of many countries (Henriksen and Andersen, 2003; Moe, 2004; Vaidya *et al.*, 2006). The underlying driver behind this, according to Panayiotou *et al.* (2004), is to provide a better level of service to the public, as well as to meet the public's expectations of cost savings and efficient processes (MacManus, 2002).

Thai (2001) noted that the adoption of e-procurement in the public sector can be viewed as an effort to revolutionise procurement processes and goals in terms of timeliness, quality, spending, risks, competition and integrity. Public e-procurement is not only the driving force for the reform of regulatory and legal aspects (Tallero, 2001), but also for policy goals such as economic development and technological innovation (Carayannis and Popescu, 2005). Importantly, it is also a pioneering tool for adherence to good governance practices. As Callender and Schapper (2003) and Wittig (2003) highlighted, levering e-procurement into the public sector to achieve better practices in transparency, accountability and integrity are crucial aspects for all government entities to consider. E-procurement offers opportunities for significant changes in transparency and opening up the procurement process to the public, ensuring fair conduct and the appropriate awarding of public contracts (Oliviera and Amorim, 2003). In a wider view of national productivity growth, e-procurement offers improvement for many countries (Hawking *et al*., 2002). Like the private sector, the public sector also obtains various benefits from the e-procurement solution (Neef, 2001).

2.7 E-Procurement Adoption in the Indonesian Public Sector

2.7.1 Background

Indonesia has been focusing its efforts to reform its governance since the regime of

President Suharto collapsed in 1998 (Nurmandi, 2013). His rule was autocratic and fostered corruption. One of the main focuses of this reform has been the development of good governance, including an effort to tackle widespread corruption and to balance regional development between eastern and western parts of Indonesia. The Indonesian government was once ranked as one of the most corrupt nations in the world, partly because of poor transparency in its procurement. In addition, the effectiveness and efficiency of its procurement procedures is essential to make savings in national expenditure by procuring goods and services at the best value in regard to quality, money and time. As in many other developing countries, Indonesia's public procurement has been one of the largest expenditures in many of its provinces. It has accounted for approximately 30% of the total provincial budget and 10% of the National GDP (Malik, 2007). Within this context, public procurement has been one of the major concerns in the national development agenda for Indonesia and has become one of the key focuses in electronic government (e-government) transformation (Wahid, 2010).

Within the global context, Indonesia could be considered as an early public sector adopter of e-procurement and this sign of progress has attracted a large amount of attention from the Indonesian Government in recent years. There is no doubt that public procurement is a fundamental pillar in the Government's ongoing attempts to improve governance, with procedures and practices evolving over the years in order to improve the legal framework of Indonesian procurement. The e-procurement adoption initiative in Indonesia began in 2003 (Wahid, 2010 and Nurmandi, 2013) with the release of the Presidential Decree Number 80 (2003) on Guidelines for Procurement of Goods/Services. This decree supported the transition of procurement processes to electronic means. Since then, the legal aspect covering e-procurement adoption has developed rapidly. The first system was piloted by the Civil Works Department and it used 'semi e-procurement', with only the documents being handled electronically. This effort came to maturity after only two years, with the addition of online announcements of tender information. A similar effort also was undertaken by the Government of Surabaya, in 2003, which successfully pioneered an e-procurement system by replacing its existing procurement procedures.

More recently, Presidential Regulation Number 54 (2010) indicated a more solid stage of e-procurement policy. In this regulation, a specific chapter on e-procurement systems was provided to establish a clear policy direction. The implication of a sub-series of legal grounds for e-procurement adoption was the final planned arrangement for 2012, by which time all organisations must conduct their procurement online (Nurmandi, 2013; Nurmandi and Kim, 2015). The starting point was in 2011, when there was an electronic announcement through the website of the national procurement portal, replacing the conventional publication methods. As a result, all Indonesian government agencies and state-owned companies were required to implement e-procurement, by law. E-procurement became a mandatory service in 2012, whereby all organisations must conduct their procurement online. To support e-procurement in the public sector, the Indonesian government established the Policy Institute for Procurement of Goods and Services (in Bahasa, it is Lembaga Kebijakan Pengadaan Pengadaan Barang/Jasa Pemerintah - LKPP) as the agency to formulate policy, procedures, standards and monitoring compliance for public e-procurement.

2.7.2 E-Procurement Adoption Process in Indonesia

In developing countries, public e-procurement is likely to be implemented at a slow pace (Bland, 2003). The Indonesian government has been struggling to develop its system over the last fifteen years and it can still be considered to be relatively immature. Despite the difficulties, the preliminary indications from the first adopters have been very promising, with a variety of benefits acknowledged for several pilot projects (Nurmandi and Kim, 2015).

After the establishment of LKPP in 2007, an e-procurement system (named SPSE; in Bahasa, an acronym for Sistem Pengadaan Secara Elektronik) was developed to provide a national platform for implementation. This system was developed with the cooperation of the National Coding Agency (in Bahasa, LEMSANEG, which is an acronym for Lembaga Sandi Negara) and the Financial and Development Supervisory Agency (in Bahasa, BPKP, which is an acronym for Badan Pemeriksa Keuangan Pusat). LEMSANEG was responsible for the security and document encryption sub-system, and BPKP was responsible for the auditing sub-system. In

order to support the e-procurement services, LKPP also established an e-Procurement Service Unit called LPSE (in Bahasa, Layanan Pengadaan Secara Elektronik) for each adopting organisation, ranging from departments, ministries, government institutions and provincial governments to city and municipality governments. This unit was responsible for troubleshooting problems, as well as the operation and maintenance of the system. In addition, LPSE also facilitated the implementation of e-procurement by providing a Procurement Service Unit at every institution (in Bahasa, it is ULP, which is an acronym for Unit Layanan Pengadaan). The ULP consisted of a procurement committee which was comprised of the procurement experts using the system. LPSE, therefore, not only became the organiser for e-procurement, but also the provider of training and support for the SPSE system, under the supervision of the LKPP. The process of e-procurement adoption in Indonesia is illustrated in Figure 2.3.

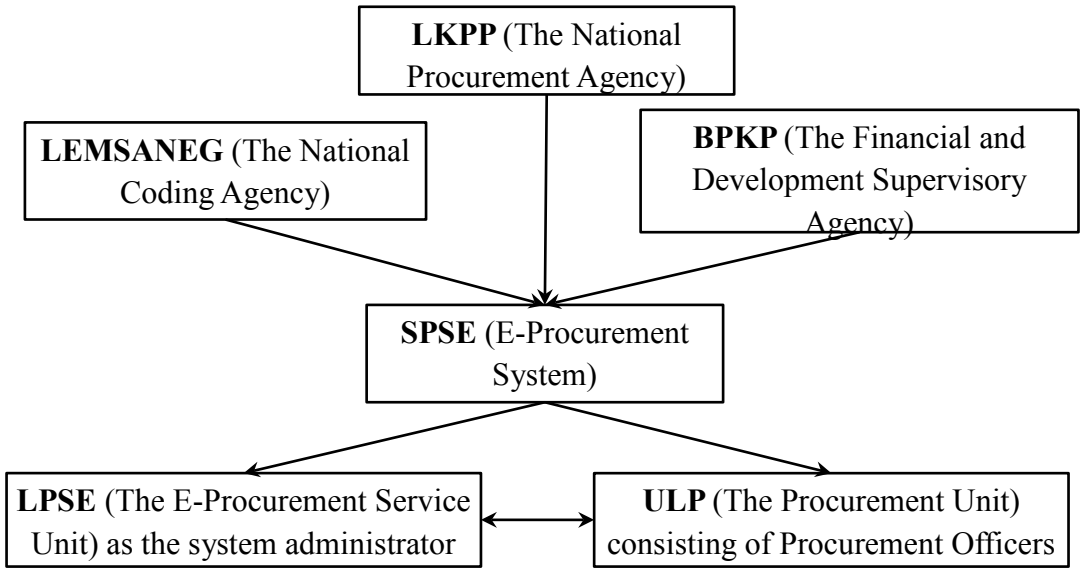

Figure 2.3 E-Procurement Adoption Process in Indonesian Public Sector

As adoption grew, various benefits materialised across the organisations. Haswidi (2007), for example, estimated that savings of about 20% to 40% of total expenditure were being experienced. Wahid (2010) more specifically recorded 50% savings for small contracts (<RP100,000,000) and around 23% for the big contracts (>RP100,000,000). Jasin (2008) reinforced these claims and reported that the government of Surabaya (one of the early adopters of the system) had made savings of from 13% up to 24% through its implementation. Perhaps, the most important

result of e-procurement adoption from the piloting locations was their adherence to the good governance principles of transparency, open and fair competition, efficiency (value for money), effectiveness, non-discrimination and accountability, as had been mandated by the legal framework of public procurement in Indonesia.

2.8 Chapter Summary

Many organisations have become reliant upon IS/IT investment to obtain a strategic and competitive advantage. Given the significance of IS/IT, it is important to ensure that the investment delivers the expected values and benefits. Thus, organisations are being urged to undergo and manage evaluation activities for their business processes to ensure the realisation of benefits accrued from their investments. An attempt has been made in this chapter to cover the basic principles of IS/IT investment, as well as evaluation and management of its benefits.

The principles of e-procurement adoption were discussed, with particular attention paid to how the identification, measurement and management of these benefits, risks, costs and critical success factors can enable the organisations to better prepare for successful e-procurement adoption. The specific challenges associated with the adoption of e-procurement within the context of the Indonesian public sector were presented. The contents of this chapter provide the knowledge foundation for a deeper understanding of e-procurement adoption that will be further examined through triangulation, using both quantitative and qualitative analyses, in the following chapters. The next chapter will discuss the principles of adoption and how the theoretical foundation for successful adoption pertains to public e-procurement. Aligning the findings from the literature reviewed in this chapter, a conceptual framework for successful e-procurement adoption will be developed.

CHAPTER 3
E-PROCUREMENT ADOPTION EVALUATION MODEL

3.1 Overview

A clear inference from the literature is that the value and benefits of e-procurement are the major drivers of e-procurement adoption. These benefits, however, can only be achieved when systems are successfully integrated into daily business (Reunis and Raaij, 2006). The adoption process is complex and difficult; therefore, necessary steps need to be undertaken, from the initial stage of adoption and throughout its implementation, to ensure that results are as expected (Pires and Staunton, 2005). The adoption of e-procurement is affected by a number of inter-related factors and its evaluation is, consequently, a challenging proposition (Osmonbekov *et al.*, 2002; Davila *et al.*, 2003; Yusoff *et al.*, 2011). Taking this into consideration, many studies have attempted to develop a model, or models, for successful e-procurement adoption.

This chapter builds on this body of work and attempts to develop a model for evaluating the success of e-procurement adoption in the public sector. Firstly, the concept of e-procurement adoption is defined and existing models of adoption from the literature are presented. This is followed by a discussion concerning the common factors of e-procurement in order to identify the variables for its measurement. The identified quality measures are then integrated into a proposed conceptual model alongside the benefits, costs, risks and critical success factors for evaluating the success of e-procurement adoption in the public sector.

3.2 E-Procurement Adoption

In the previous chapter, the potential benefits of e-procurement were shown to provide positive impacts for any organisation, whether private or public. Importantly, achieving the full benefit from e-procurement highly depends upon acceptance and

use of the system (Henriksen and Mahnke, 2005; Reunis and Raaij, 2005; Van Raaij *et al.*, 2007; Li *et al*., 2015). However, the extent and level of the adoption may be variable and resource-dependent (Pires and Staunton, 2005). As with the definition of e-procurement, the term 'adoption' also has been defined in various ways. A typical definition from the Information Systems (IS) literature states that adoption can be viewed as the process of making full use of technological innovation (Rogers, 2003). In the context of e-procurement adoption, according to Chang and Wong (2010), this means making full use of technology for searching, obtaining quotes and acquiring goods or resources using the Internet. In addition, Vaidya *et al*. (2004) further defined e-procurement adoption as the simplification of procurement activities by operationalising technology and streamlining organisation and management. Thus, it is defined in this study that e-procurement adoption is an ongoing process undertaken by organisations to streamline and integrate their procurement activities by making full use of systems and technology over the internet. In addition, due to the focus of this study and within its context, 'organisations' relates only to the Indonesian public sector.

3.3 E-Procurement Adoption Models

This study aims to develop a model for evaluation of e-procurement adoption in the public sector. In the literature, there are numerous studies that have attempted to develop a model for e-procurement adoption. However, there has been no single research instrument that may provide a comprehensive model to evaluate e-procurement adoption. There was limited historical and academic literature concerning e-procurement evaluation in the public sector (Vaidya *et al.*, 2006). It has not been adequately explored, resulting in a gap in the literature when analysing and evaluating e-procurement (Mora-Monge *et al.*, 2010; Fernandes and Vieira, 2015).

Despite that gap, the researcher suggests that some models can be used to explore public e-procurement. The following are the most commonly cited models, which also underpin the proposed model for evaluation of e-procurement adoption in this study. They depict the building blocks that represent e-procurement adoption.

3.3.1 E-Procurement Framework, by Gunasekaran and Ngai

A comprehensive framework for e-procurement adoption was first developed by Gunasekaran and Ngai (2008) in their study on e-procurement adoption within Hong Kong industries. The study identified the perceived critical success factors and perceived barriers for the successful adoption of e-procurement in Hong Kong. The proposed model shows determinants that should be considered while adopting e-procurement as presented in Figure 3.1.

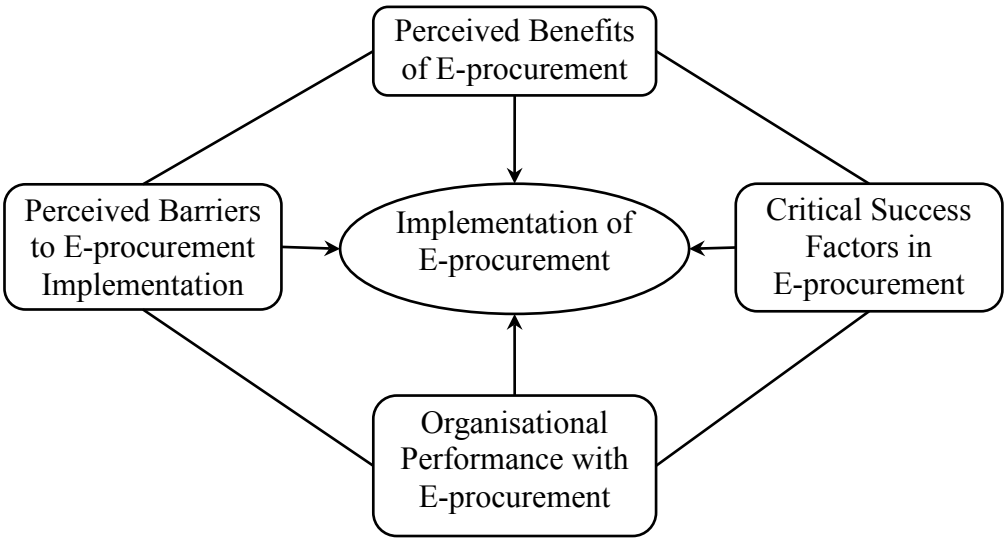

Figure 3.1 E-Procurement Adoption Framework (Source: Gunasekaran and Ngai, 2008: p. 163)

Further development of the model was performed by Gunasekaran *et al.* (2009) in a study of e-procurement adoption for Small Medium Enterprises. This model modified the previous e-procurement adoption model as had been suggested by Gunasekaran and Ngai (2008), to fit SMEs as shown in Figure 3.2.

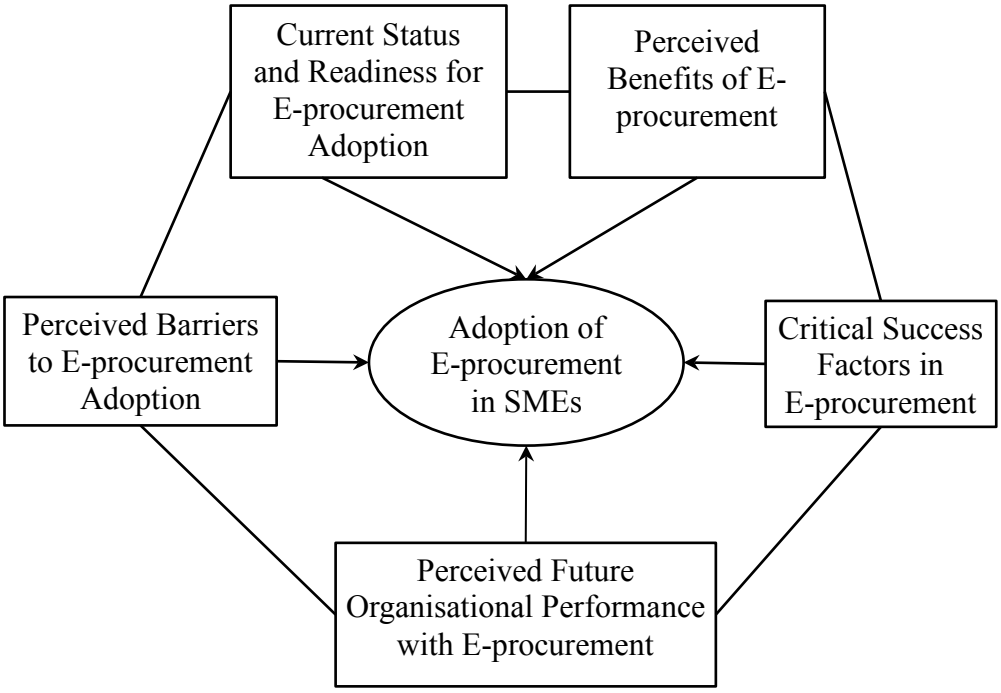

Figure 3.2 Adoption of E-Procurement Model for Small Medium Enterprises (Source: Gunasekaran *et al*., 2009: p.163)

Altayyar and Beaumont-Kerridge (2015) evaluated the benefits of, and barriers to, e-procurement adoption in Saudi Arabia by applying the Gunasekaran and Ngai (2008) model. It is noted that both that model and the 2009 adaptation were developed within the context of private organisations. However, it is a generic framework that can be expanded, modified and tailored to public e-procurement.

3.3.2 Technology Organisation Environment Model (TOE)

There are various ways that e-procurement adoption can be viewed. One of them is through observation of three factors: technology, organisation and environment. A commonly cited model is the TOE model developed by Tornatzky and Fleischer (1990), which determines the process of adopting and implementing technology. The technological context refers to the perceived internal and external benefits, and includes factors such as ease of use of the system. The organisational context relates to perceived organisational factors such as scope, size, human resource quality, managerial structure and resources available internally. The environmental context

relates to external pressures such as the characteristics of the industry and market, as well as government regulations.

Notably, the TOE model has been employed in many studies to analyse the adoption of e-procurement (Premkumar, 2003; Teo and Pian, 2004; Zhu and Kraemer, 2005; Hassan, 2013). For example, a study by Teo *et al.* (2009) built on the concepts of TOE to examine the various factors that influence e-procurement adoption in Singapore. They addressed the key factors that are related to technology, including perceived direct benefits, perceived indirect benefits and perceived costs, while the organisational factors emerged as firm's size, top management support and information sharing culture, and the environmental factors were associated with business partner influence. Likewise, Yu-Hui (2008) postulated a technology-organisation-environment model to study the factors that impact e-procurement adoption in Chinese manufacturing companies. A brief description of the model, as used by those two studies, is illustrated in Figure 3.3.

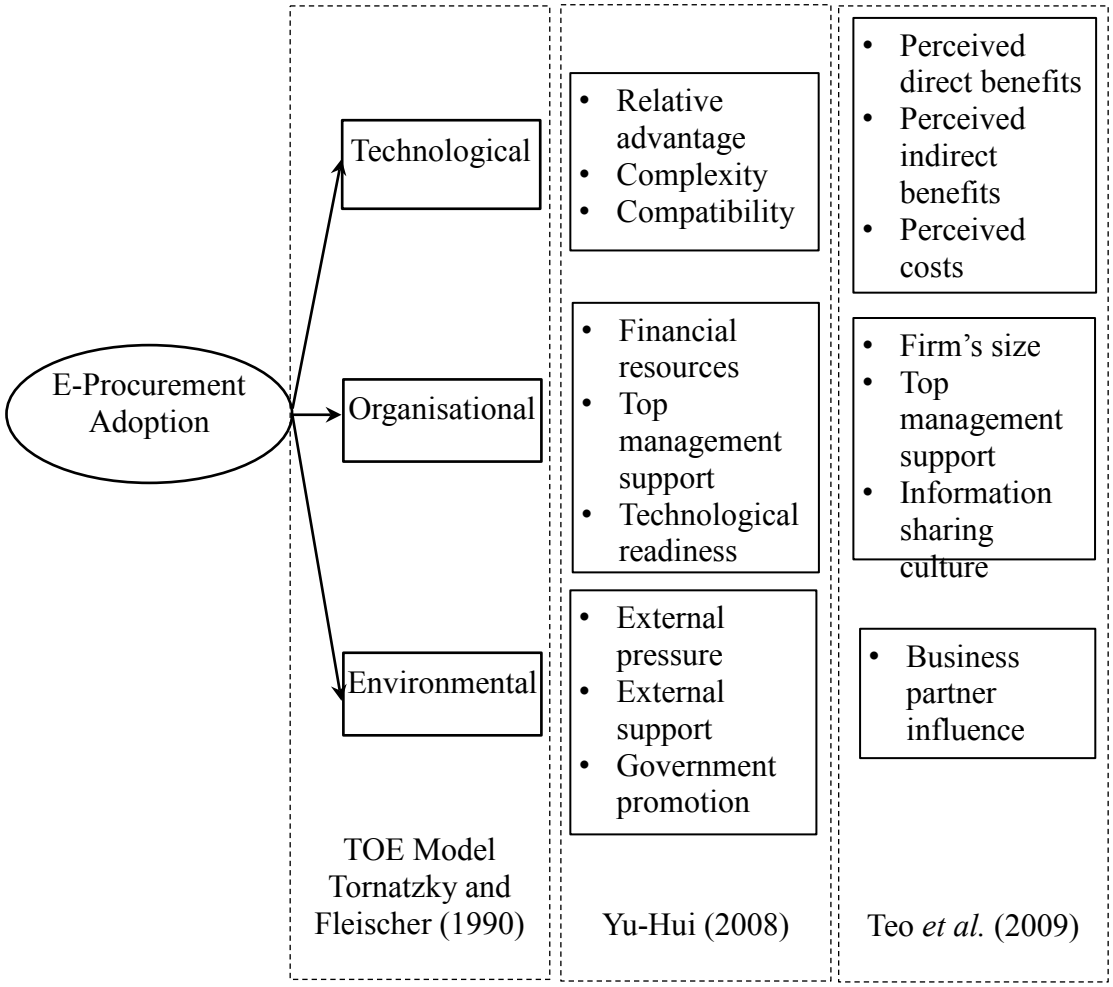

Figure 3.3 Technology Organisation Environment (TOE) Model for E-Procurement Adoption

Considering both studies, the common supporting factors within each context are: technology - relative advantage, complexity and compatibility; organisation - top management support, user involvement, organisational size and resources; Environment - influences from business.

3.3.3 E-Procurement Adoption Framework for Suppliers

Andrade *et al.* (2012), in their study, attempted to establish a framework to identify the contributing critical factors of e-procurement adoption between suppliers. This framework was developed based on the e-procurement adoption framework of Gunasekaran and Ngai (2008). The framework also was complemented by the TOE model (Teo *et al.*, 2009) in which the external environment dimension was added to the model focusing on the business partner influences to e-procurement adoption

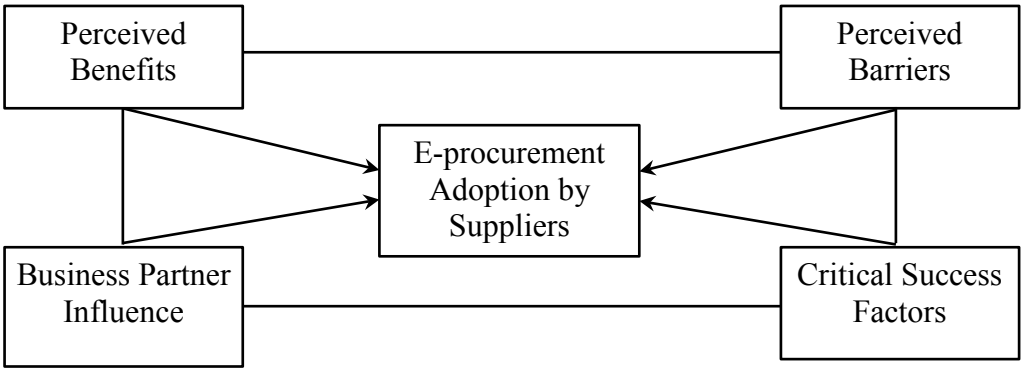

Figure 3.4 E-Procurement Adoption Framework by Suppliers (Source: Andrade *et al.*, 2012: p. 217)

This section has discussed the models for e-procurement adoption from the literature that are relevant to this study. However, the earlier studies presented in this section have not framed the evaluation determinants collectively, based on multiple dimensions, particular in relation to the quality aspect of e-procurement adoption. Notably, e-procurement later became apparent as a contributor to internal customer service and compliance improvement (Croom and Johnston, 2003). A key determinant that contributes to e-procurement compliance has been system quality (Reunis *et al.,* 2004; Brandon-Jones, 2005). This highlights the need for measuring the performance and quality of e-procurement adoption (Vaidya *et al.* 2004). The next section examines some of the e-procurement quality measurements and the model that is to be adopted in this study.

3.4 E-Procurement Quality Model

Many studies have been useful to assess the impact of e-procurement adoption on the quality of services (Brandon-Jones and Croom, 2005; Brandon-Jones and Silvestro, 2010). Service quality is strongly influenced by the Service Quality (SERVQUAL) methodology introduced by Parasuraman *et al.* (1988, 1991 and 1994). Although there have been criticisms of the concept, it has been widely adopted in measuring service quality (Buttle, 1996). Within the context of e-procurement, many studies have attempted to use and modify the SERVQUAL scale to assess the quality of e-procurement. Finally, in the light of a study conducted by Brandon-Jones and Croom

(2005), the model of perceived E-Procurement Quality (EPQ) has been used to develop a set of quality dimensions to be incorporated into the research model. These will be discussed in the next two subsections.

3.4.1 SERVQUAL Model

Numerous literatures have applied the Internal Service Quality (ISQ) approach. In relation to e-procurement, however, there has been limited research on ISQ (Brandon-Jones & Croom, 2005). The fundamental model to define and measure service quality, proposed by Parasuraman *et al.* (1988) is the well-known SERVQUAL model. Due to the paucity of literature, prior studies on the quality of e-procurement have mostly chosen to adopt the SERVQUAL model, but with several justifications needed to accommodate the required modifications to assess ISQ.

In the initial 1988 study, the SERVQUAL model was constructed from ten key determinants of service quality based on the customers' expectations and after service perceptions. They are reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding of the customer and tangibility. Further studies by Parasuraman *et al.,* (1991 and 1998), refined and simplified the model to five key determinants of service quality: reliability, assurance, responsiveness, tangibles and empathy. However, SERVQUAL has been exposed to several conceptual and operational criticisms including its limited applicability and lack of validation of the model (Buttle, 1996). Moreover, the determinants are not always generic (Carman, 1990; Buttle, 1996) and often need to be varied, subject to the types of service. Johnston (1995) reinforces this, advocating that such models are not applicable to all industries and suggesting that they should be tested for applicability in different contexts. Parasuraman *et al.* (1988) acknowledge this weakness within the model and suggest that SERVQUAL needs to be adapted and supplemented to suit the needs of a specific context. Hence, further research needs to be undertaken to assess the applicability of SERVQUAL for internal service measurement in the context of e-procurement (Brandon-Jones and Silvestro, 2008).

Many studies have attempted to develop service quality measurements for e-procurement, including Croom and Johnston (2003); Croom and Brandon-Jones (2005 and 2007); Raaij *et al*. (2007); Brandon-Jones (2008 and 2009); and Brandon-Jones and Carey (2011). One of the first adaptations of SERVQUAL in the domain of e-services was as a result of a study by Johnston (1995), which identified 15 determinants (1995). The results of this study were further modified by Croom and Johnston (2003) in order to measure internal services within the e-procurement context. In their research, they employed the 15 measures proposed by Johnston (1995), consisting of attentiveness, responsiveness, care, security, reliability, availability, integrity, friendliness, courtesy, communication, competence, functionality, commitment, access and flexibility. However, these proposed SERVQUAL-based models provide only a basic model that deals with perceived quality (service quality) without taking customer satisfaction into account. The applicability of the model also was found to be limited. To address this limitation, further studies attempted to develop the model for assessing ISQ within the e-procurement setting. This will be discussed in the next subsection.

3.4.2 E-Procurement Quality (EPQ) Scale

Subsequent work carried out by Brandon-Jones and Croom (2005) built on the SERVQUAL model in order to assess ISQ within the e-procurement setting. This included consideration of customer satisfaction and led to the examination of a total of 33 factors, consisting of 19 system factors and 14 support factors. The focus of the measurement scale was the assessment of (EPQ). The construct items deployed to measure ISQ have been derived from a range of literatures on internal service, service quality and e-service (Brandon-Jones, 2008). Brandon-Jones (2008) further developed the EPQ model to construct a perceived e-procurement quality measurement scale. Brandon-Jones introduced six factors that are associated with two major categories of e-procurement, these being system and support factors. The system factors were processing, content and usability, while the support factors were professionalism and training. Further studies (Raaij *et al.,* 2007; Brandon-Jones, 2008 and 2009) then examined the validity and the reliability of the EPQ scale to help improve e-procurement compliance. In their findings, there has been clear

evidence of a positive relationship between perceived e-procurement quality and user compliance with the requirements to use new systems.

Brandon-Jones and Silvestro, in 2010, also attempted to test the measurement of ISQ in relation to e-procurement. They carried out various tests to measure the reliability and validity of the EPQ measures using two approaches; gap-based and perceptions-only. As a result, they found four factors that were not significant and, therefore, were deleted. The final measures consisted of 30 factors. Later, Brandon-Jones and Carey (2011) further explored the relationship between quality and compliance, resulting in the expansion of their model to include three further system dimensions, i.e. 33 supporting components of assessment. As in their previous studies, they revealed that user perceptions of e-procurement considerably affected user compliance with both the system and the contract. In particular, the 2011 study found that system compliance is strongly affected by professionalism and content, while compliance with the contract is related to processing, specification and content. Reinforcing the results of Brandon-Jones and Silvestro (2010), their analysis also revealed that, of the original 33 factors, there were only 30 factors considered to be significant. Therefore, the 30 factors have been the basis of EPQ measurement used in this research. A complete breakdown of the EPQ scale can be seen in Figure 3.5.

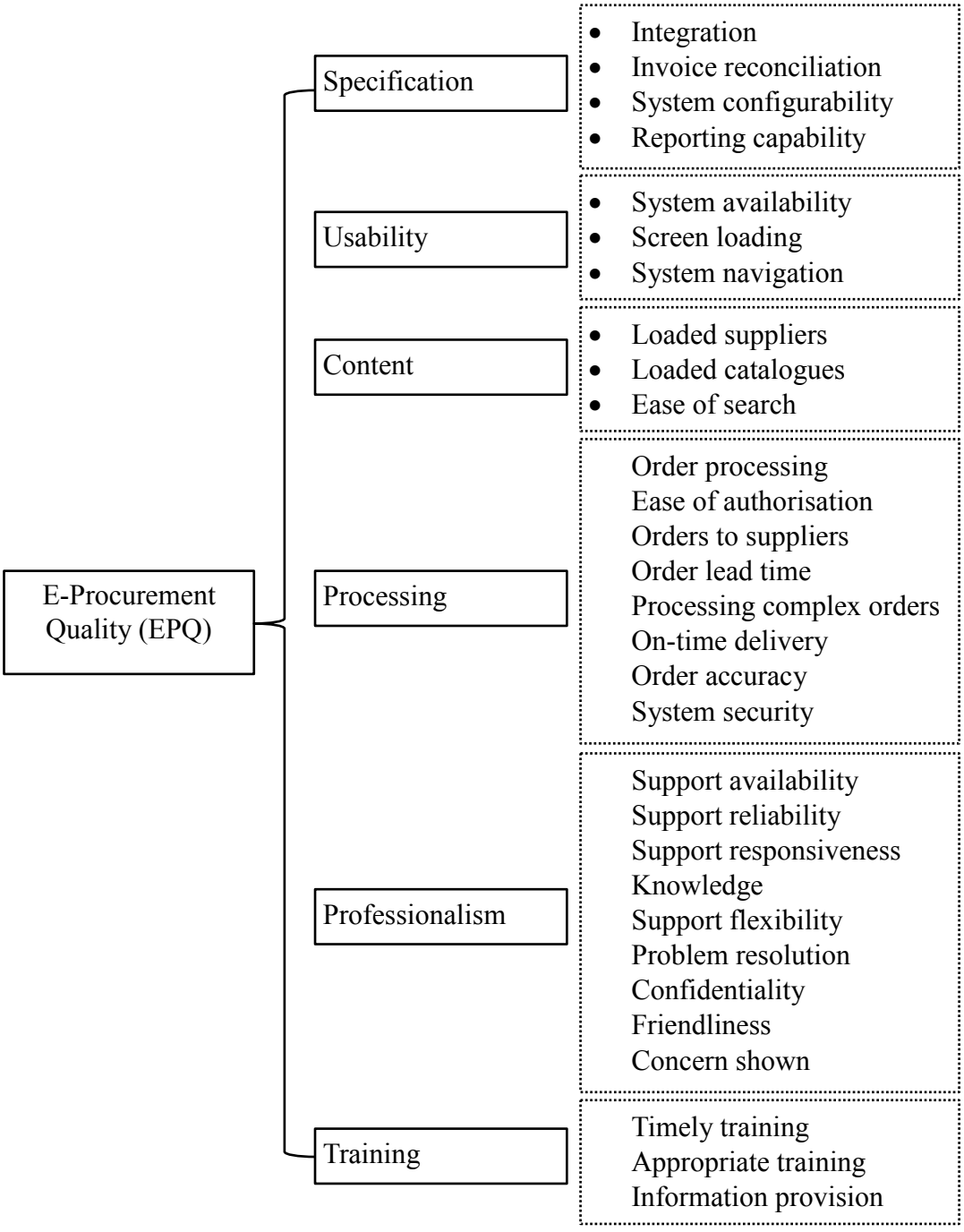

Figure 3.5 E-Procurement Quality (EPQ) Measurement Scale (Source: Brandon-Jones, 2008)

In regard to the applicability of the model for this study, this model is a generic model that can be applied within the context of public e-procurement. Several studies have used the EPQ measurement scale for the public sector (Brandon-Jones, 2006; Raaij *et al*., 2007). Having established the suitability of the EPQ model proposed by Brandon-Jones (2005), the EPQ measurement scale will be utilised to assess the

quality of e-procurement within the Indonesian public sector. The next section discusses the specific model for evaluating public e-procurement adoption.

3.5 Model for Evaluation of Public E-Procurement in Indonesia

Based on the literature review and the theories on e-procurement adoption presented in this chapter, an e-procurement adoption model has been developed to meet the objectives of this study. This model builds on the e-procurement conceptualisation provided in the last two chapters of this study. It comprises five major dimensions, which are: (i) benefits, (ii) costs, (iii) risks, (iv) critical success factors, and (v) e-procurement quality. This model will be utilised to examine the adoption of e-procurement by the Indonesian Public sector. Each of the dimensions will be examined to meet the objectives of this study. The proposed model for e-procurement adoption in this study can be seen in Figure 3.6.

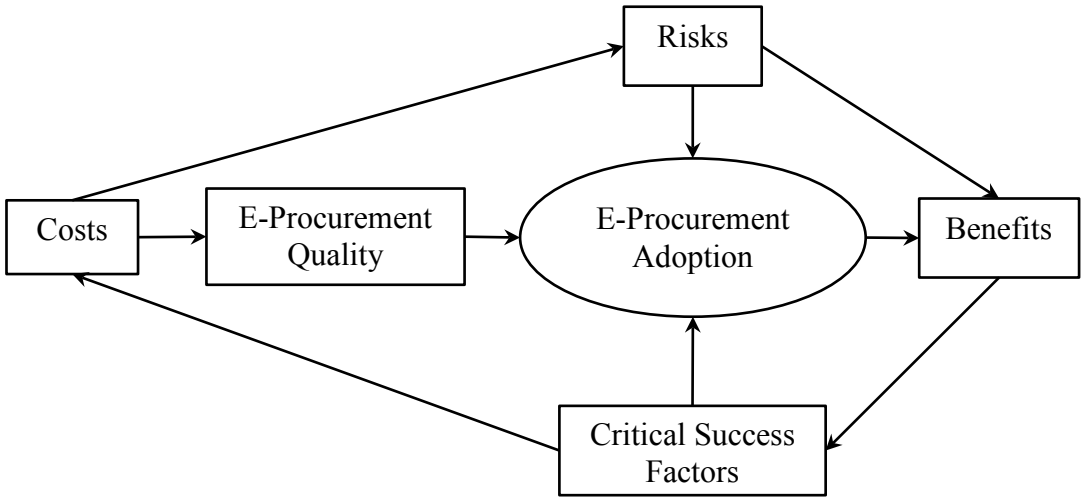

Figure 3.6 Theoretical Model for the Adoption of E-Procurement

This framework has been expanded, taking into consideration the many models previously discussed, to construct a comprehensive e-procurement model measurement (Figure 3.7).

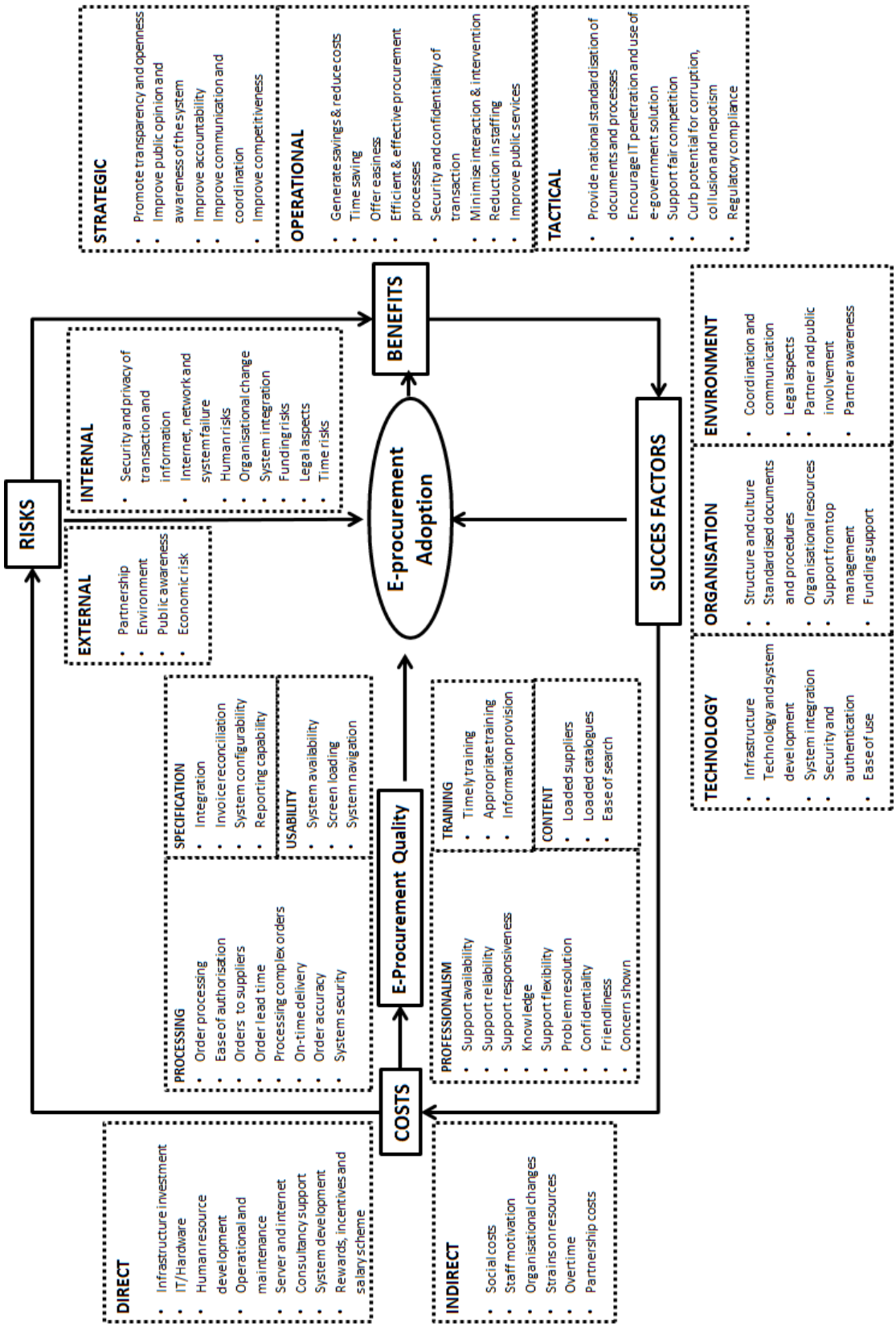

Figure 3.7 Comprehensive Framework for E-Procurement Adoption Success Model

3.6 Chapter Summary

This section of the research aimed to develop a model for evaluating the adoption of e-procurement within the public sector. In this chapter, the literature on e-procurement adoption has been discussed and e-procurement adoption has been defined as the uses of technology to facilitate the procurement of goods and services by an organisation over the internet. To deepen understanding of the adoption of e-procurement, a number of adoption models from various studies were presented.

Attempts were also made to identify the quality of e-procurement. Numerous literatures on the Internal Service Quality (ISQ) approach were explored and discussed to define the quality measures of e-procurement. They were mostly extracted from the SERVQUAL model. Hence, a scale for the measurement of e-procurement quality has been proposed for inclusion in the initial model. Finally, a conceptually comprehensive e-procurement adoption models was developed to meet the objectives of this study. This model builds on the e-procurement conceptualisation provided in the last two chapters of this study. The conceptual model consists of the five major dimensions of benefits, costs, risks, critical success factors and e-procurement quality. This model will be used in the following chapters of this study to examine and evaluate the adoption of e-procurement in the Indonesian Public sector.

CHAPTER 4

METHODOLOGY AND RESEARCH DESIGN

4.1 Introduction

The previous chapters have described the evaluation of e-procurement adoption, including the context of the Indonesian public sector. This chapter outlines and justifies the research methodology adopted for this study. Justification is presented to describe previous research on e-procurement adoption undertaken by researchers. The rationale behind the selection of the methodology is presented. The details of approach and procedures taken for the case study and questionnaire are discussed. Then, the plans for data analysis and quality assessment of validity and reliability are introduced and outlined. This chapter also highlights ethical considerations and limitations of this research.

4.2 Research Philosophy for the Research

Research is undertaken within most professions and fields of study. Research, according to Johnson (1994) should be: focussed and not general; systematic, structured and organised; beyond general knowledge; provide the basis for analysis; and explicatory in regard to the issues. Research starts with a series of questions or problems, followed by decision-making that utilises a particular philosophy to guide the research (Brannick and Roche, 1997). Angell (2004) argued that all forms of research are underpinned by its methodologies. Saunders, Lewis and Thornhill (2000) proposed how research should be undertaken; calling it a research 'onion' that consists of layers: research philosophy, approach, strategy, time-frame and data collection methods.

Research methodology, according to Remenyi *et al.* (1998), is the procedural framework of a research that entails a paradigm, the processes of acquiring knowledge and a philosophical 'world view'. Accordingly, many factors have to be considered in defining the appropriate methodology for research (Remenyi *et al.,*

1998). The two major paradigms are objectivism and subjectivism. They also are acknowledged variously in the literature; sometimes referred to as positivism and phenomenology, or positivist and interpretive, and many alternative terms (Easterby-Smith *et al.,* 1991; Yin, 1994; Denzin and Lincoln, 2000; Flick, 2009). For the purpose of this study, the terms positivistic and interpretive are used.

4.3 Justification of the Research Approach

This study aims to evaluate the adoption of e-procurement in the Indonesian public sector. A critical issue in this research is choice of the most appropriate approach to be employed to perform the evaluation. It is both critical and crucial to acknowledge the methodologies used by previous researchers of e-procurement adoption that can be found in the literature.

The survey questionnaire has been the most popular method used in many e-procurement adoption studies. For instance, a study by Gunasekaran and Ngai (2008) attempted to develop a framework for e-procurement adoption through the use of a survey questionnaire. Further research in Small Medium Enterprises (SMEs) by Gunasekaran *et al.* (2009) also employed a questionnaire-based survey to formulate a conceptual model for successful e-procurement adoption. Further, a study that examined the technological, organisational and environmental factors related to e-procurement adoption, by Teo *et al.* (2009), used a survey that was distributed in Singapore. Within the context of public e-procurement adoption, a study in Malaysia by Kaliannan and Awang (2010) utilised questionnaires to identify the readiness of government suppliers to adopt an e-procurement system. In the Indonesian public sector, Wahid (2010) used questionnaires to examine the factors affecting e-procurement adoption by applying the perceived characteristics of an innovation framework.

Aboelmaged (2010) established a research model to predict e-procurement adoption in developing countries by incorporating the Technology Acceptance Model (TAM) and the Theory of Planned Behaviour (TPB). This study conducted a structural equation modelling (SEM) analysis of survey questionnaires. Similarly, Madeja and

Schoder (2003) utilised SEM to test a model for e-procurement adoption, and its effects on corporate success, against the data collected from a questionnaire. The SEM approach also was employed in a study of e-procurement adoption in Indian government departments (Padhi and Mohapatra, 2009). Notably, the SEM method has been a popular approach in e-procurement adoption research to test the hypotheses and the e-procurement adoption model proposed. The use of SEM verified that the models fit the empirical data and it was used to test the causal structure of the proposed model in many researches. Additionally, SEM is able to assess the measures and correct for any measurement error in a model.

On the other hand, the qualitative research using surveys also has become increasingly employed in many e-procurement adoption studies. Many recent researchers have used case-based approaches, utilising interviews to provide more detailed information about e-procurement. For example, a study by Veit *et al.* (2011) developed a research model to investigate the determinants of e-procurement adoption at the municipal level in Germany, which was further examined using data collected via interviews from a multiple-case study. Likewise, a different study attempted to explore the e-procurement adoption of a hotel company (Kothari *et al.*, 2007) by applying a case-based study approach that used semi-structured interviews. Tatsis *et al.* (2006) also conducted interviews for four case studies to examine the drivers and impediments to e-procurement adoption in the Greek food and drink industry. Many studies in public e-procurement adoption also have used case studies; for example, two studies on public e-procurement by Henriksen and Mahnke (2005) and Bof and Previtali (2007) in Denmark and Italy, respectively.

Alternatively, the mixed methods that triangulated the findings from both a quantitative approach, such as surveys, and a qualitative approach, like a case study were also used in e-procurement adoption studies. For instance, a study by Stein and Hawking (2003) performed triangulation of two approaches to ascertain the role of e-procurement as an emerging model of the e-marketplace in Australia. In the first stage, a questionnaire was developed from the literature review that attempted to identify how Australian organisations performed procurement. In the second stage of the study, a single case study approach was used to explore best practice of an

organisation in its e-procurement adoption. Data was collected from interviews, together with any internal and external supporting documents. The multiple data sources were employed to enable data triangulation that strengthened the overall validity and reliability of the study (Yin, 2003).

A similar approach can be found in a two-phase study by Chang and Wong (2010). Their hypotheses and a model of firm motivation for adopting e-procurement were developed from the literature. Sequential triangulation was applied, in which the findings from the interviews were used as the theoretical base for development of the survey questionnaire. Following that, the hypotheses were tested using the questionnaire. The model was examined using the SEM technique. Many other studies on e-procurement adoption have advocated the use of triangulation (e.g., Davila *et al.*, 2003; Moe, 2004; Reunis *et al*., 2004; Salleh *et al*., 2006; Hardy and Williams, 2007; Walker and Harland, 2008; Aman and Kasimin, 2011; Adil, Nunes and Peng, 2014).

Notably, the popularity and effectiveness of triangulation methods in studying e-procurement adoption make it worthy of consideration. Triangulation has been suggested as an ideal strategy to examine the same phenomenon from various perspectives, while also providing deeper insight and understanding of the topic (Jick, 1979). The rationale of this approach is that the strengths and weaknesses of the combined styles complement and counterbalance each other (Love *et al.,* 2002). Thus, the methodological design of this research employs triangulation because it provides a richer and more comprehensive approach (Neumann and Wiegand, 2000). The triangulation used in this study exploits the qualitative data from case study interviews and the quantitative data from a questionnaire. A literature review on e-procurement adoption was used to construct the foundation for the conceptual model of this study and a follow-up case study provided insight on current e-procurement adoption at a greater depth, which further assisted the questionnaire development. The questionnaire was developed to examine the model and the proposed hypotheses of this study in order to draw more appropriate conclusions.

4.4 Empiricism

Empirical research has been a practical way to investigate the natural world, based on observation and experiences rather than mere reasoning (Morick, 1972). Love (2001) explained that, in empiricism, the questions regarding natural human thought and actions must be tested against observations of the natural world. Empirical insights have ensured that existing theories were not simply made up by the researcher (Oppenheim, 1992) and they can lead to better understanding (Green *et al.,* 2010). Thus, science is to be considered as methodologically empirical in nature.

E-procurement has been a hot issue within construction management research in recent years because it is an effective strategy to facilitate procurement activities within organisations and businesses. Research in construction management, according to Abowitz and Toole (2009), is essentially a social process. In a similar way, Love, Holt and Li (2002) described construction management as standing at the intersection of natural science and social science. It is a natural science because it observes events of natural phenomena based on observation and empirical evidence, while also being a social science because it investigates the phenomena concerned with the participants being studied and their relationships. There are two major research philosophies in both social studies and natural science; they are the positivist and the interpretivist approaches (Galliers, 1991).

4.4.1 Positivism

A central tenet of positivism is that the reality in the world exists and can be discovered with scientific methodologies (Bassey, 1995; Cohen *et al*., 2000). The underlying ontology of positivism is that every scientific concept can be observed and measured (Hessler, 1992). Positivism is primarily based on deductive theory, in which the propositions are generated and tested using an empirical approach (Babbie, 2005). In positivist research, both the formulation and testing of hypotheses are essential to enable inferences to be drawn about a phenomenon in relation to the sample population (Orlikowski and Baroudi, 1991; Cresswell, 2003; Johnson and Onwuegbuzie, 2004). A positivist researcher maintains distance from the participants and remains detached from what is being researched in order to create a distinction

between personal cognition and science (Carson *et al.,* 2001). The positivist research paradigm is underpinned by quantitative methodologies, like the use of a questionnaire (Cohen *et al*., 2000; Mutch, 2005).

4.4.2 Interpretivism

The philosophical basis of interpretivist research is to study phenomena in their natural environment, which incorporates the interactions of the researchers and affects the phenomena being studied (Neumann, 2003). In contrast to positivism, the interpretivist approach treats both the researchers and subjects as research participants because the researchers' perceptions are embedded in their analyses of the participants' experiences when feeling, hearing and observing how the participants interpret the issues being researched (Cresswell, 2003). The research design for interpretivism uses a qualitative methodology to examine, interpret and define the realities (Cohen *et al.,* 2000; Mutch, 2005).

4.4.3 Deductive and Inductive

Science, according to Pirsig (1981), can be pursued in two ways; by induction or deduction. Likewise, Perry (1998) differentiated between the two research approaches, deductive and inductive, based on the logical construct of the phenomenological paradigm. Trochim (2006) suggested that inductive research begins with observations of the specific and arrives at a general conclusion, while deduction, in reverse order, commences with a general thrust and ends with explicit observations. Similarly, Creswell and Plano-Clark (2007) stated that deductive research "works from the 'top down', from a theory to hypotheses to data to add to or contradict the theory" (p.23), while inductive research begins from "the 'bottom-up', using the participants' views to build broader themes and generate a theory interconnecting the themes" (p. 23). A deductive approach is performed to test the theory and usually moves from a hypothesis, with emphasis on causality, while the inductive approach aims to explore new theories emerging from the data, using research questions.

In research, there are two major types of analysis used: the quantitative and the qualitative. The quantitative paradigm is highlighted as being positivistic, hypothetico-deductive, outcome-oriented, particularistic, objective and using a natural science worldview. In contrast, the qualitative paradigm is characterised as phenomenological, inductive, holistic, process-oriented, subjective and using a social anthropological worldview. In quantitative research, the theory is tested deductively, seeking out causality for the hypotheses. Qualitative research, in contrast, collects information to identify themes that will enable the development of general conclusions or theories inductively (Creswell, 2005). Therefore, this study adopts both inductive and deductive research approaches. The inductive research employs a case study to generate new theory in regard to e-procurement adoption, while the deductive research utilises a questionnaire survey to consider the existing theory. Having acknowledged the distinction between both reasoning styles, this study was conducted by combining inductive and deductive reasoning by simultaneously synthesising both quantitative and qualitative strands (Love *et al*., 2002).

4.5 Research Methodology Adopted for the Research

A methodology depicts the theoretical and philosophical assumptions of the research and illustrates the whole research process (Saunders *et al.,* 2009). The selected methodology, should be able to adhere to the research problems and to define the stance of the researcher's point of view (Marshal and Rossmann, 1999, Anderson and Poole, 2009), and therefore many factors have to be considered in defining the appropriate methodology for the research (Remenyi *et al.,* 1998).

This research aims to gain a better and more in-depth understanding of the e-procurement phenomenon. It is argued that using both quantitative and qualitative approaches is the most appropriate methodology for this study. Both quantitative and qualitative methods are beneficial to reveal the issues and to answer the requirements of this study, while triangulation will be used to complement the strengths and weaknesses of both methods. It is notable that several studies in e-procurement adoption have advocated the triangulation approach in data collection.

In this study, the research design uses sequential triangulation in which qualitative (case study) and quantitative (questionnaire) methods are employed simultaneously to explore the topic of the study.

4.5.1 Research Framework and Procedures Adopted

The research framework adopted in this study is illustrated and summarised in Figure 4.1. The research procedures conducted in this study are comprised of three main stages:

1. Performing review of literature: the purpose of this study is to explore and to evaluate e-procurement adoption in the public sector, incorporating determinants of benefits, costs, risks, success factors and quality through a review of the literature. Accordingly, the literature review was used to conceptualise a framework for e-procurement adoption that could be applied in the public sector.
2. Undertaking case study: a case study, through interviews, was conducted to test the conceptual model. Semi-structured interviews were used to gather qualitative data from five case studies and complemented with data obtained from the documentary sources available for each case. The qualitative data were analysed using 'within–case' analysis for each case, coupled with 'cross-case' analysis across all five case studies.
3. Conceptualisation of the study: the knowledge contained from the literature and the findings from the interviews were used to conceptualise the model for evaluation of public e-procurement adoption and to aid the determination of research hypotheses. This theoretical base was used to develop the survey questionnaire for hypothesis testing and refining of the conceptual model. Thus, the case study has been found to be important in providing a solid base for the subsequent quantitative analysis (Flyvbjerg, 2006).
4. Undertaking survey and performing quantitative analysis techniques: the model and hypotheses derived from the case study were tested with a survey questionnaire. Quantitative statistical analysis through SEM and CFA were used to validate the model and the hypotheses. The research findings then could be

used to discuss the determinants to be considered important for successful e-procurement adoption (Creswell, 1994).

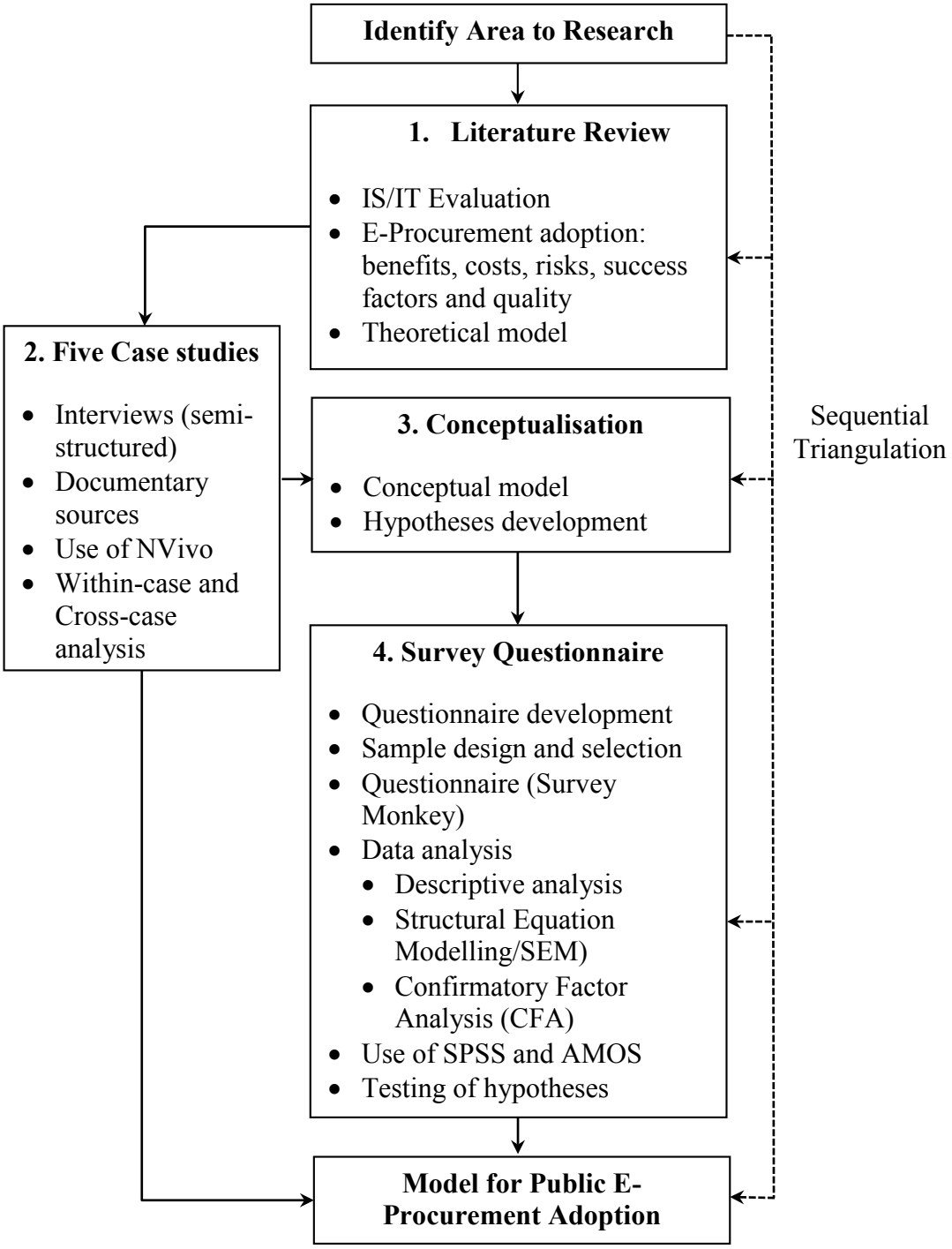

Figure 4.1 Research Framework

4.5.2 Sequential Triangulation

The selection of the appropriate method is crucial in every study because it acts to defend the research as well as to attain solutions for the problems. This study was undertaken to evaluate e-procurement adoption in the public sector. The topic of research is a complex issue that entails many determinants and variables, as proposed in the conceptual model. As a consequence, the study was based on the selection of sequential triangulation.

Triangulation, according to Love *et al.* (2002) is appropriate for extending the theoretical scope of research by maximising and combining the amount of data collected. Triangulation, through the use of multiple research methods applied sequentially or simultaneously, provides more comprehensive data (Neuman, 2000; Abowitz and Toole, 2010). It has been a valuable strategy to combine approaches so that strengths and weakness are counterbalanced and complemented by each other (Green *et al*., 1989; Miles and Huberman, 1994; Fellows and Liu, 2008). Importantly, it brings benefits such as improving confidence in the research data, enhancing innovation through better understanding of phenomena, disclosing unique results and challenging, or even combining, theories (Jick, 1979). It also enables flexibility, integration and holistic approaches in solving multi-faceted issues (Powell *et al*., 2008). Sequential triangulation employs the methodology and results of the first approach to develop the methodology of the second approach (Teddlie and Yu, 2007). For example, Van Teijlingen *et al.* (2001) employed interviews in the first stage of their research to investigate the issue and then followed up with a questionnaire to verify the findings. In a similar way, this study used the qualitative approach (interviews) in the first phase as the sampling frame for the quantitative approach (questionnaire).

The research started with a review of literature related to the topic. As the research progressed, the literature was updated and refined to support the findings from the case study and survey. A critical review of the extensive literature on various disciplines including supply chain, governance, information systems and construction management was performed. A summary of the state-of-the-art in

relation to the issue of e-procurement adoption was provided. The literature review was used as the basis for conceptualising the research topic into themes and a model.

Following, the case study interviews were performed to verify and refine the conceptual model. An interview protocol was developed to assist the researcher and to provide the general approach of the research, including its significance and the procedure to be undertaken. Semi-structured interviews were used to gather qualitative data from five case studies. In total, 34 participants were interviewed and sampled purposively. Interviews were conducted individually in order to stimulate dialogue and to remove barriers between the researcher and participants. The data collected was audio-recorded and noted, then translated and transcribed. The findings from this stage were used as a theoretical base from which to develop a survey questionnaire.

The questionnaire was developed through the online Survey Monkey and distributed to the e-mail addresses of the potential respondents. The respondents were the government officials who were dealing with e-procurement activities nationwide in Indonesia at the time. They were selected from the database of the national procurement agency. The data was gathered for further analysis, using SEM to test the model, and the hypotheses were developed. Finally, both data from qualitative and quantitative sources were combined and discussed simultaneously to synthesise findings and to provide greater insight in relation to the topic (Leicht *et al.,* 2010).

4.6 Case Study

Case study research is an approach that is concerned with describing, understanding and predicting the causal links within a real life context. This approach has been widely discussed by other scholars in their works (Benbasat *et al.,* 1987; Yin, 2003). The case study can provide an in-depth understanding (Patton, 1997) for contemporary problems within a real-life situation (Baruch and Callaway, 1985). In addition, Benbasat *et al.* (1987) proposed that this approach is suitable when the research and theory are still at an early formative stage.

Case study research advocates the exploration of a phenomenon in its natural context (Sjoberg *et al.,* 1991). Smith (1988) stated that case studies expand the opportunities to explore the wide range of behaviours from a group or individual perspective; and to reveal rare phenomena, ideas and the hypotheses that support theory development (Eisenhardt, 1989). However, a case study is of limited use in generalising the findings statistically (Cavaye, 1996). It is unable to describe causal links among research variables. Case studies also lack rigour (Yin, 1994), and potentially create biases due to their subjective design (Hessler, 1992). They also require an excessive volume of data collection (Yin, 2003).

The case study can be conducted either as a single event or as multiple case studies. A single case is useful to provide an in-depth and rich description of a phenomenon. It can be purely descriptive, or used for theory development or theory testing (Markus, 1989). Meanwhile, multiple case studies consist of more than one case and attempt to analyse the data across cases (Yin, 1994). Multiple cases support investigation of cases that are characterised as literal replication and theoretical replication. Yin (1994) also claimed that multiple case studies are more compelling and robust. However, they also require a greater variety of resources, impacting on the time and expense required for research. In this study, multiple case studies have been selected as the research strategy. It has been found to be the most suitable strategy to allow an in-depth and detailed study. This also enables comparison between cases, adding confidence in the findings.

4.6.1 Case Study Selection

Case selection aims to create and test new interpretations (Kuzel, 1999). It focuses on in-depth inquiry and the richness of responses from a relatively small sample that is selected purposefully rather than as representative of the larger population (Patton, 1990; Kuzel, 1999). Therefore, purposive sampling is the most appropriate strategy for multiple case studies. The selection of cases, according to Kuzel (1999), needs to consider the two important aspects of appropriateness and adequacy. Appropriateness refers to the fulfilment of both the purpose of the research and the phenomenon examined (Patton, 1990; Miles and Huberman, 1994; Kuzel, 1999).

Adequacy can be associated with the flexibility of choosing the cases and the richness of information to be gained from the cases. Further, Yin (1994) stated that the selection of cases can be based on the three main criteria of convenience, access and geographic proximity.

In this study, the cases were selected based on the following criteria: convenience, access, appropriateness and adequacy. Five cases were selected for the study. The same conditions also were applied to the selection of individuals from each case. The participants were small in number for each case: at least three people to a maximum of twenty people. Technically, each potential participant received an invitation and consent form that provided the background, process, procedures and significance of the study. Interested participants were asked to provide feedback either via email, letter or telephone. In total, there were 34 interviews to be conducted.

4.6.2 Data Collection Strategy

In case studies, data collection can utilise different sources of approach. Interviews, according to Yin (1994), have been one of the most important sources of information in case studies. They can be categorised as completely unstructured, semi-structured and fully-structured interviews. Unstructured interviews are difficult to analyse because participants are allowed to talk freely about whatever they think. Meanwhile, a structured format is too rigid because participant's responses are limited to answering direct questions. As this study aimed to explore deeper insights into the adoption of e-procurement, it was decided to employ in-depth, semi-structured interviews.

Semi-structured interviews have been found to be advantageous for many reasons. They encourage participants to freely express their thoughts about the research questions. They enable verbal communication and interaction between the interviewer and participants, to gain as much information as required (Burns and Grove, 1997) and to learn about their individual terminology and judgements, perceptions and experiences (Yin 1989, Patton 1990). In addition, they offer flexibility by keeping the discussion within a frame while still giving participants a

wide opportunity to talk freely. The steps and approaches utilised in semi-structured interviews are presented in Figure 4.2. (For details, see Appendix B).

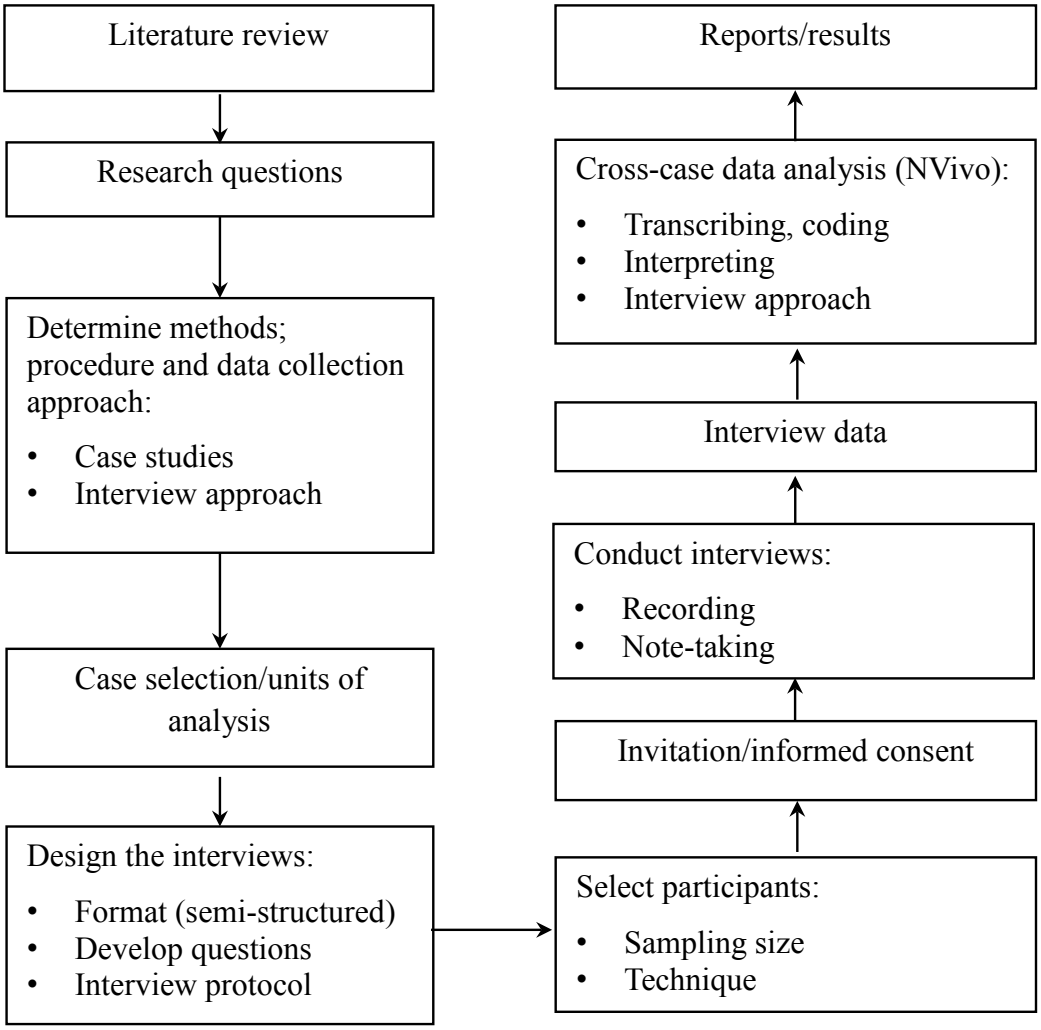

Figure 4.2 Semi-structured Interview Design

4.6.3 Documentary Sources

As noted previously, triangulation of data sources provides richness of data and more in-depth insight from each case (Easterby-Smith *et al.,* 2004). Besides the interviews conducted for the five case studies, complementary data was gathered from the documentary sources available for each case. The documents used were elicited both from case organisations' internal records, such as official websites and reports, and from external sources including related articles, papers and reports. Analysis of the

documentary sources can be used to complement and cross-check the information from interviews, which can improve the reliability of the findings (Love, 2001). Content analysis was used to extract the information required from the documents (Krippendorf, 1980).

4.6.4 Qualitative Data Analysis

The qualitative data for this study was acquired from semi-structured interviews and review of documents from the case organisations. It was planned to use most of the data from interviews for further analysis with the complimentary review documents of the case organisations. However, analysing qualitative data is a complex task because it entails more than just analysing the text and documents themselves (Creswell, 2013). It involves "organising the data, conducting numerous transcript readings, coding and organising themes or categories and creating an interpretation of them" (Creswell, 2013, p.179).

In order to help the investigator to manage the qualitative data, NVivo – qualitative data analysis software – has been utilised (Walsh, 2003). NVivo provides support for data management, text retrieval, coding and conceptual mapping. In this study, the investigator managed to prepare the qualitative data by transcribing, coding and interpreting prior to data analysis. Thereafter, it was further decided to employ 'within-case' analysis for each case and to follow this by cross-case analysis across all five cases. The steps in analysing the cases are presented, as follows:

- Transcribing: the data of 34 semi-structured interviews from five cases were transcribed into transcripts in Word format. As the responses were in Bahasa Indonesia, all transcripts then were translated into English by the interviewers. Interviewers initially checked the transcribed interviews, which were then proofread by the researchers.
- Coding: it is an analytical technique used to organise raw qualitative data into refined categories, themes and concepts. Miles and Huberman (1994) described coding as including the assigning of tags or labels to the pieces of data that illuminate what the pieces are actually about. There are three common types of

coding for qualitative analysis and, as applied in this study, they are: open, axial and selective coding (Strauss and Corbin, 1998; Charmaz, 2006). Open coding is the initial organisation of data by labelling words and phrases found in the transcripts. Axial coding extends analysis of open coding to include identifying relationships among open codes. It is the process of interconnecting categories to sub-categories (Charmaz, 2006). Selective coding includes combining and refining the categories from open and axial coding to develop a story and concepts that emerge from the data (Strauss and Corbin, 1998).

The transcribed interviews were coded using NVivo software. NVivo supports transcript coding based on the location of the data in nodes and node trees (Walsh, 2003). Firstly, open coding was performed to provide themes and sub-themes that were developed from the five key areas of the study. Following that, axial coding was employed whereby each node was investigated to find the relationships and to categorise parent nodes into sub-categories/child nodes. A number of important themes and concepts that emerged from the data were selected by selective coding for further analysis.

- Interpreting: it is the process of identifying and describing the meaning of the data. This includes revisiting the transcripts to look for patterns that might connect emerging themes and sub-themes to enable a bigger picture of what it is all about. Data interpretation can be performed during coding by categorising data into specific themes. Data interpretation could be done continually throughout qualitative analysis. In this study, NVivo provided analytical and visualisation features to assist with interpretation of the data.

4.6.5 Within-Case Analysis and Cross-Cases Analysis

It was decided that data collected from the case studies should be analysed using 'within–case' analysis for each case, coupled with 'cross-case' analysis across all five case studies. Within-case analysis, according to Pettigrew (1988), is useful to cope with a huge amount of data acquired from each case. Within-case analysis provides a list of themes or key categories that emerge from each of the case organisations (Huberman and Miles, 1994). In particular, for this research, it alert the investigator to the presence of the five key themes of benefits, costs, risks, success

factors and quality of e-procurement adoption that relate to the research framework that was finally developed. Technically speaking, interview transcripts of each case were coded into key themes using NVivo software. The data was then synthesised into tables for each of the cases. The results of analysis for each case then could be further compared across all five cases.

It was planned to carry out cross-case analysis across all five cases to enhance the generalisability of the research and to deepen understanding and explanation of the findings (Miles and Huberman, 1994). Cross-case analysis advocates clustering of findings and allows generalisation from commonalities and patterns across the cases. The results from the cross-case analysis then could be aggregated and integrated to update the conceptual framework developed from the literature review. The framework that was developed in this way became the basis for further analysis in the quantitative stage using the questionnaire.

4.6.6 Trustworthiness

For case studies, the issue of trustworthiness is the key consideration of any research (Lincoln and Guba, 1985). While the positivist researcher uses the criteria of validity, reliability, objectivity, precision and generalisability to measure the rigour of quantitative findings, the qualitative researcher, as Guba (1981) proposed, uses the following four criteria to ensure the trustworthiness of a case study:

- Credibility (in preference to internal validity): in addressing credibility, this study adopted particular strategies including the employment of well-recognised methods (case study) and the use of triangulation of different methods. This triangulation also included the use of different types of data source, a variety of informants and different locations (Cases). In addition, the iterative examination of previous research findings was used to assess any congruency with previous similar studies.
- Transferability (in preference to external validity/generalisability): this can be met by providing sufficient detail of background data to enable comparisons to be made with another setting that is familiar to the reader.

- Dependability (in preference to reliability): provision can be made to address dependability by providing a detailed report of the study to allow a future investigator to repeat a similar study.
- Confirmability (in preference to objectivity): in order to achieve confirmability, the researcher must ensure that the findings emerge from the data itself instead of from their own perspectives. Triangulation of multi-sources of evidence can alleviate investigator bias.

4.6.7 Limitations of Case Study

Five cases were studied in evaluating e-procurement adoption in the Indonesian public sector. However, it has been suggested that case studies have limitations for a number of reasons which include:

- A case study threatens external validity because it is limited in its suitability for generalising the findings statistically (Cavaye, 1996).
- It is also unable to describe the causal links among research variables. Case studies also lack rigour (Yin, 1994).
- A case study potentially creates misinterpretations and biases due to its subjective design (Hessler, 1992).
- It also requires an excessive amount of data collection (Yin, 2003). Thus, it also requires various resources, impacting on the time and cost required for the research.

4.7 Research Hypotheses

In conjunction with the research objectives and the findings elicited from the literature and cross-case analysis of the five cases, a number of hypotheses were developed. There were nine hypotheses relating to the identified five constructs for successful e-procurement adoption posited as follows:

1. E-Procurement Costs

   $P_1 - H_0$: The greater the costs incurred for e-procurement, the greater are the risks that may be imposed

P1 – H1: The greater the costs incurred for e-procurement, the lower are the risks that may be imposed

P2 – H0: The greater the costs incurred for e-procurement, the better is the quality of the system

P2 – H1: The greater the costs incurred for e-procurement does not result in better quality of the system

2. E-Procurement Quality

P3 – H0: The better the quality of the system, the better is the adoption of e-procurement

P3 – H1: The better the quality of the system does not lead to better adoption of e-procurement

3. E-Procurement Risks

P4 – H0: The greater the risks of e-procurement, the lower is the adoption of e-procurement

P4 – H1: The greater the risks of e-procurement does not contribute to lower adoption of e-procurement

P5 – H0: The greater the risks of e-procurement, the lower are the benefits acquired

P5 – H1: The greater the risks of e-procurement does not cause lower benefits to be acquired

4. E-Procurement Benefits

P6 – H0: The greater the benefits of adoption, the wider are the success factors

P6 – H1: The greater the benefits of adoption does not result in wider success factors

P7 – H0: The higher the level of e-procurement adoption, the higher are the benefits acquired

$P_7 – H_1$: The higher the level of e-procurement adoption does not lead to higher benefits being acquired

5. E-Procurement Success Factors

$P_8 – H_0$: The wider the success factors, the better is the adoption of e-procurement

$P_8 – H_1$: The wider the success factors does not contribute to better adoption of e-procurement

$P_9 – H_0$: The wider the success factors, the higher are the costs required

$P_9 – H_1$: The wider the success factors does not require higher costs

These hypotheses were tested quantitatively using the questionnaire survey, which is presented in the next section.

4.8 Survey Questionnaire

A survey is a research strategy by which information is collected from people who are representative of a population. The survey method focuses on measuring variables associated with survey objects (Neumann, 2000) and also attempts to discover common relationships, as well as the incidence and distribution of variables (Kerlinger, 1973). The information collected from a survey is used to generalise findings from the sample to the wider population within a certain degree of random error. Denscombe (1998) further stated that surveys are intended to provide a snapshot of the object at a particular time. A questionnaire survey has many advantages including:

- A large volume of data is collected from a population in a short period of time, and via an economical means. The findings can be generalised to a population (Bell, 1996).
- The data collected are standardised and structured, making them easier to understand and to compare. Being quantifiable and empirical representations of a real life condition, surveys minimise interviewer bias.

In this study, the survey questionnaire was administered to test the hypotheses empirically according to the combined findings from the literature review and case study section of the research.

4.8.1 Questionnaire Development

The questionnaire was developed to conduct a survey for this study that was based on the relevant literature and the case study results, and was designed to test the hypotheses according to the proposed research model. The questionnaire utilised some closed questions that the respondents were required to answer by ticking boxes next to their selected responses. The scaled response options used a Likert scale, categorised from '1' for 'not at all' to '5' for 'very large extent', to determine the degree of adoption for each question posed to the respondents. The developed questionnaire consisted of three main parts (detailed below) that were constructed from the proposed model and the research hypotheses. The first part covered general information of e-procurement adoption. Following that, a section identified the variables of e-procurement such as benefits, costs, risks and success factors. Additionally, the quality of e-procurement was measured. The final section provided general comments and the researcher's appreciation for their participation. This also included details for further communication, if required. The questionnaire can be found in Appendix C1.

1. General information on current e-procurement adoption: this section was necessary to gain information about the general background and demographics of the respondents. The questions in this section were designed to explore the respondents' positions, work experiences and training gained in relation to e-procurement adoption. This section is useful to ensure the representativeness and reliability of information provided by respondents through the questionnaire. Two questions in the demographic section used a nominal scale (categories with no implied order) while another one used true numeric values that represent a measure.

2. Identification of variables of e-procurement adoption: the main focus of this section was to identify and measure the variables of benefits, costs, risks and critical success factors in relation to e-procurement adoption at the respondents' organisations. In the second section of the questionnaire, a five-point Likert scale was used to allow the respondents to express their opinions of the extent of their agreement and disagreement with particular statements.

   The items concerning benefits describe the relevant strategic, operational and tactical benefits that were prevalent in the adoption of e-procurement at the respondents' organisations. The items on costs consisted of the two determinants of direct and indirect costs incurred from e-procurement adoption, while risks included the internal and external items, and the critical success factors related to the technological, organisational and environmental factors that affected the uptake of e-procurement. This section also identified and measured the quality of e-procurement using items that addressed professionalism, processing, content, training, specifications and system use.
3. General comments: this final section summed up the questionnaire and offered appreciation to the respondents for their participation in the study. It also included the option to provide further details of the respondents if they wished to obtain a summary of findings for their documentation. The researcher contact details also were provided for further communication.

4.8.2 Design of Questionnaire

In designing a survey, Borg and Gall (1989) proposed major steps for questionnaire development, including: defining objectives, sampling selection, writing items, developing the questionnaire, pre-testing, organising a letter of transmittal, distributing the questionnaire and following up the results. In this study, the steps and approaches that were used are presented in Figure 4.3 (and in Appendix C2).

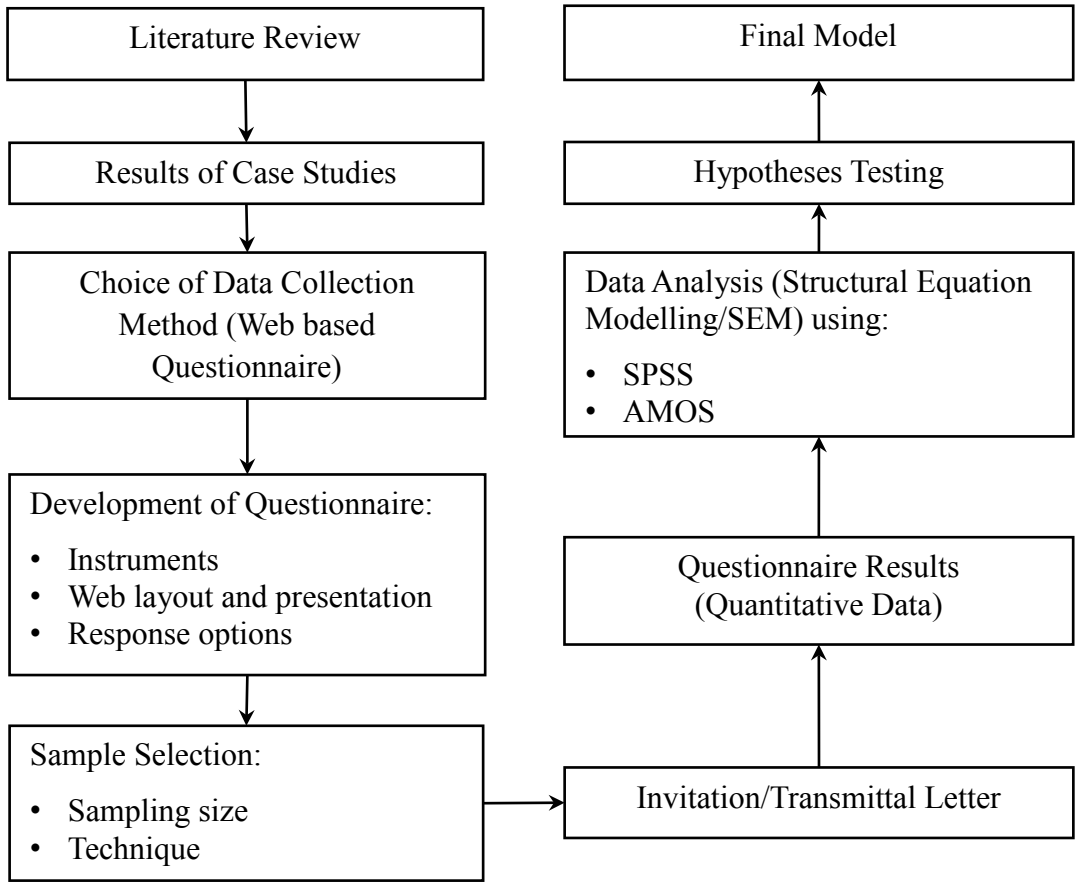

Figure 4.3 Survey Questionnaire Procedures

4.8.3 Sample Design and Population

This study was performed using a web-based survey questionnaire (Survey Monkey) that was made available to all potential participants in the population of interest. Accordingly, simple random sampling was selected and a sampling frame had to be determined. In this study, the sampling frame was all individuals or officers involved in e-procurement adoption in the Indonesian public sector. The list was acquired from the database of the Indonesian government's e-procurement services in which all participants could be contacted via web or email. This approach is beneficial for a broad range of population coverage. The individuals were selected randomly with no specific measures or stratification imposed by the sample frame. It was proposed that the individuals would be invited to participate in the survey via email or any other means, for example, telephone, messaging, or even social networking like Facebook. They would receive a brief explanation of the background of the study, as well as a

link to the online survey. Interested participants would be asked to complete the online survey through Survey Monkey.

4.9 Quantitative Data Analysis

The quantitative analysis is divided into three main phases reflecting the method of analysis used. The first phase is preliminary analysis of the data from the questionnaire. Preliminary analysis includes survey administration, response rate, descriptive analysis and data screening, non-response bias and demographics of the respondents. The next phase is the Structural Equation Model (SEM). This includes Confirmatory Factor Analysis (hereafter referred to as CFA) as well as the assessment of goodness-of-fit indices, reliability and validity tests for the measurement model and the developed structural model. The last phase is testing of hypotheses. The quantitative analysis that was employed in this study is illustrated in Figure 4.4.

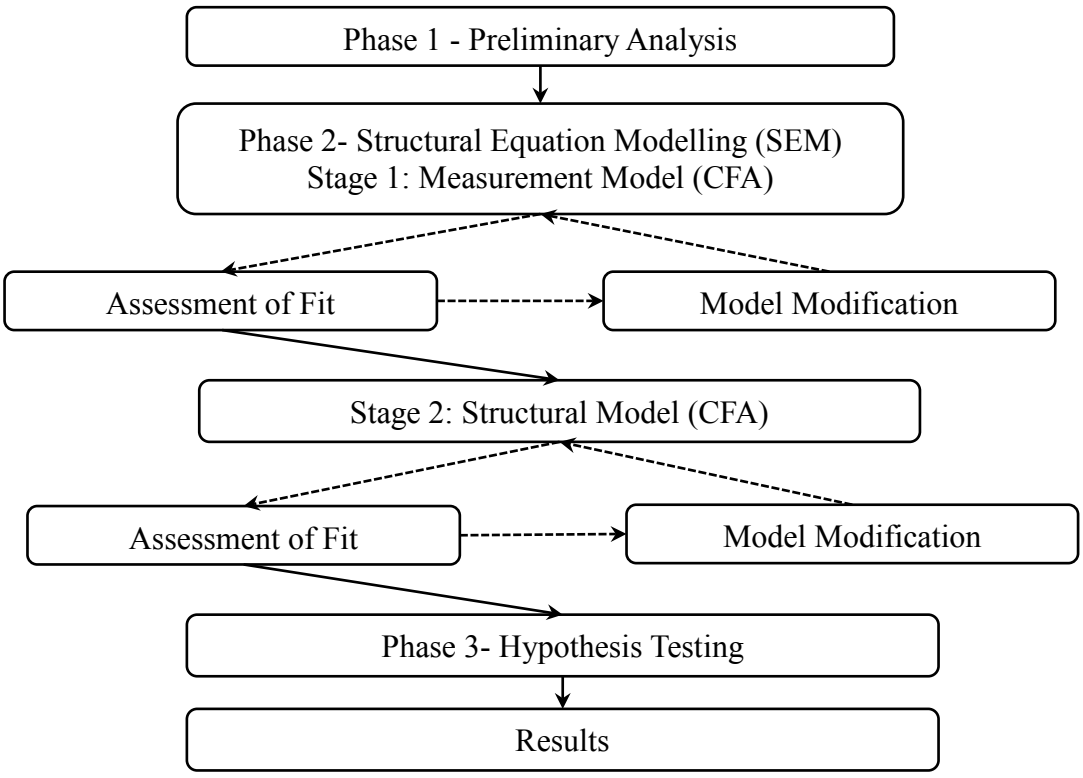

Figure 4.4 Structural Equation Modelling (SEM)

4.9.1 Preliminary Analysis

The preliminary analysis provided an overview including survey administration, response rate, descriptive analysis, data screening, non-response bias and demographics of respondents (Sekaran, 2000). Data obtained from the online survey questionnaire was analysed using the software package: Statistical Package for Social Sciences (SPSS) version 22.0. SPSS was used to carry out data screening as well as the assessment for detecting missing data and outliers, and measuring data normality. In addition, SPSS performed analyses of the response rate and non-response bias, and provided descriptive statistics of the data. The details of the preliminary analysis are described as follows:

- Survey Administration: after completing the survey format using the online tool Survey Monkey, the invitations to participate in the online survey were distributed electronically to respondents' email addresses. The invitation also provided a link to Survey Monkey if targeted respondents were interested in participating. Otherwise, they may choose to opt out of the survey and would not receive any further notices or reminders. The respondents were selected based on the list of procurement officers from the National Procurement Agency (LKPP) database.
- Response Rate**:** in this research, a low response rate could have become a major issue leading to a higher chance of bias and a lower capacity to make generalisations. To overcome this issue, both prior to and during deployment of the online survey, attempts were made to boost the response rate. They included:

    - The questionnaire was clearly designed with a simple and easy layout to ensure respondents could understand the questions. A brief description of the research was provided and the significance of completing the questionnaire was clearly explained.
    - Effective email invitations were developed to deliver a message that would attract respondents to participate. This included a letter of recommendation from the National Procurement Agency (LKPP) in consideration of its full support and explaining the significance of the research.

- The lists of email addresses and contacts were obtained from the database of the National Procurement Agency (LKPP), which is only available to restricted and authorised personnel.
- In the invitation, the option was given to respondents either to opt in, and be directed to the link for Survey Monkey, or to opt out if they so desired.
- A brief summary of results also was offered to respondents, so that they would be able to view the effects of their participation.

- Descriptive Statistics**:** The descriptive statistics were developed to describe any patterns that emerged from the data. This was undertaken for all indicators using SPSS. Descriptive analysis aims to develop the mean, minimum, maximum and standard deviation values for each variable.

  - Data screening: this is crucial to make sure the correct data are entered, that they are reliable and valid and that they conform to the normal assumptions for further statistical analysis (Hair *et al.,* 2006). This involves dealing with any missing data, detecting outliers and confirming the normality of data (Kline, 2005). Data from the questionnaires was reviewed to examine the errors caused by inappropriate responses or incompleteness leading to invalid data or missing values (Jackson, 2008). Detecting outliers is crucial because it can affect statistical results and skew the normality of data (Tabachnick and Fidell, 2007). Univariate outliers from the data can be detected using the standardised z-scores. From the literature, a value of $z > 4$ demonstrates an extreme observation (Hair *et al.*, 1998). In order to measure the normal distribution of the data, skewness and the Kurtosis test are used where values that are smaller than 2 and 7, respectively, can be considered to have normal distribution (Kline, 2005; Cunningham, 2008).
  - Non-response bias test: The non-response bias assesses differences between the responses of respondents and of 'non-respondents' who have participated in the survey. Technically, the method proposed by Armstrong and Overton (1977) compares the responses of early respondents with those of late respondents both on basic demographic variables and on survey constructs.

The independent samples T-Test and Mann-Whitney U-Tests were used to test non-response bias on selected variables.

- Demographic information of the respondents: a detailed description of the respondents was collated, including their positions, work experiences and training attended for e-procurement.

4.9.2 Structural Equation Modelling (SEM)

Structural Equation Modelling (SEM) is a statistical tool that has been commonly utilised by many academic researchers (Anderson and Gerbing, 1988; Kline, 2005). It is a multivariate statistical analysis approach to quantify theoretical relationships among variables by combining aspects of multiple regression and factor analysis (Tabachnich and Fidell, 1996; Hair *et al.,* 1998). There are two main components of the model that distinguish SEM, namely a measurement model and a structural model (Hair *et al.,* 2006).

- The measurement model shows relationships between the observed/measured variables and the latent/unobserved variables they are designed to measure (Hair *et al.,* 2006). In the measurement model, all latent constructs are allowed to correlate with each other. It can be further separated into the formative and reflective models. A formative model causes the latent variables, while a reflective model is itself caused by the latent variables.
- The structural model defines the relationships between the theoretical constructs of the measurement model, which are indicated by 'paths' connecting the variables (Nunnally and Bernstein, 1994). A connecting 'path' indicates a variable that affects the value of another variable in the model, either directly or indirectly (Byrne, 2001).The structural model can be used to test the relationship between the latent variables in the proposed model (Kline, 2005).

4.9.3 Confirmatory Factor Analysis (CFA)

CFA is a method used to test the proposed theory or model (Bollen, 1989) and to examine relationships between the indicator variables (measurement items) and the latent variables (Byrne, 2001). In CFA, each of constructs is analysed and, if required, the model is modified and reanalysed (Hair *et al.,* 2006). More importantly, CFA is used to assess and to evaluate uni-dimensionality, the goodness-of-fit of the model, and the validity and reliability of the measures (Hair *et al.,* 2006).

- Justification for SEM: SEM using the Analysis Moment Of Structures software (AMOS) version 22.0 was selected for this study to analyse and interpret statistical data from SPSS (Arbuckle, 2008) for many reasons. Firstly, SEM allows a complete investigation of the relationships among the multiple dependant variables of this study. SEM enables simultaneous assessment of relationships within the measurement model (relationships between constructs and measures) and the path model (relationships between constructs). Secondly, SEM also provides rigorous statistical techniques to examine complex models (Bryne, 2001; Hair *et al.,* 2006). Further, SEM supports assessment of the uni-dimensionality, reliability and validity of each variable (Kline, 2005). The relationships between variables and indicators were validated using CFA in order to determine the goodness-of-fit of the model (Kline, 2005).
- Two stages of SEM: in the second phase of this analysis, SEM utilised CFA to analyse the measurement model and the structural model to test the hypothesised model. The examination of a model is performed by testing the relationships of exogenous (independent) constructs and endogenous (dependent) constructs simultaneously (Hair *et al.,* 2006; Rouse and Corbitt, 2008). AMOS was used within this stage of SEM to analyse and interpret the data (Arbuckle, 2008). This phase employed two stages of the SEM approach (Anderson and Gerbing, 1988), which include:

    - The first stage of the SEM process was CFA of the measurement model. This stage assessed the measurement model fit and, where necessary, modification of the measurement model was conducted for improvement of model fit

(Anderson and Gerbing, 1988). In addition, CFA also provided preliminary analysis prior to SEM analysis to verify the factor structure of the measurement instruments and to examine reliability and validity of the constructs of the model.

- The second stage was the structural model development to test the hypothesised relationships. Likewise, assessment of fit and model modifications were conducted to identify the best fit model (Hair *et al.,* 2006).

- Hypothesis Testing: finally, a complete investigation of the hypothesised correlations between variables was assessed based on the results of the two stages of structural equation modelling (SEM). Testing the hypotheses was carried out by examining individual parameter estimates for each specific hypothesis (Hair *et al.,* 2006). Hypothesis testing was performed by examining the sign, size and significance of the coefficient paths of the structural model. In total, there were nine hypotheses to be tested using the structural model from the SEM output.

4.10 Reliability and Validity

4.10.1 Goodness-of-Fit Assessment (Fitness Indices)

During the SEM process, the 'fit' of statistics should be evaluated to ensure whether the model is fit to the data or whether any modification is required to improve model fit. There are many goodness-of-fit indices to measure model fit, hence, it is important to employ multiple fit indices to test model fit (Wheaton, 1987). Hair *et al.,* (1998) describe three types of index to measure the fitness of measurement models. These three categories are absolute fit index, incremental fit index and parsimonious fit index.

Absolute fit indices measure how well the model fits the data sample (Hu and Bentler, 1999). Absolute fit indices include the chi-square ($\chi 2$), Goodness-of-Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA) and Standardized Root Mean Square Residual (SRMR). Incremental fit indices, or comparative relative fit indices, compare the proposed model to a baseline model. There are four types of

index for this category; they are the Adjusted Goodness-of-Fit (AGFI), Comparative Fit Index (CFI), Tucker Lewis Index (TLI), and Normed Fit Index (NFI). Meanwhile, parsimonious fit indices compare between models with different numbers of estimated coefficients (Hair *et al.,* 1998). This category of indices can be measured by the normed chi-square ($\chi 2/df$). The details of the GFIs utilised as guidelines in this research can be found in Appendix C3.

4.10.2 Reliability Measurement

Reliability can be defined as the extent to which the measurement of a phenomenon is free from random error and can provide consistent results (Malhotra, 2003; Zikmund, 2003). Yin (1994) further explained that the purpose of a reliability test is to reduce any errors and biases in the research. Reliability should be examined to determine the quality of the instrument (Churchill, 1979). There are three generally accepted methods to assess reliability of the construct, and they are: (1) Cronbach's alpha; (2) Construct Reliability (CR); and (3) Average Variance Extracted (AVE). In this research, Cronbach's alpha values for all constructs are measured using SPSS, while both CR and AVE are computed manually using all results from AMOS, after the CFA.

Cronbach's alpha is the most common method to measure reliability (Sekaran, 2003). Different levels of cut-off point for alpha have been suggested in the literature. However, the generally agreed level of acceptance is 0.70 (Hair *et al.,* 2006). Therefore, in this research, the alpha should exceed 0.70 to indicate internal consistency. In addition, the values of CR and AVE should meet the requirement of being equal to or greater than 0.60 and 0.50, respectively (Bagozzi and Yi, 1988). The formulae used to calculate the CR and AVE have been proposed by Fornell and Lacker (1981):

$$CR\ (\eta\rho) = \rho\eta = (\Sigma\lambda\ i)2/[(\Sigma\lambda\ i)2 + (\Sigma\lambda\ j)2\ ]$$

$$AVE\ \rho ve(\eta) = \Sigma\ (\lambda\ i)2/[\Sigma(\lambda\ i)\ 2 + \Sigma(\lambda\ j)\ 2]$$

where * $i\lambda$ = standardised factor loading.

The summary of reliability measures can be found in Appendix C4.

4.10.3 Validity Measurement

Validity can be defined as an assessment of the accuracy of an instrument within a study (Zikmund, 2003; Malhotra, 2004). There are three categories of validity that were employed in this research, namely content, construct and criterion validity. Content validity represents the ability of an instrument to cover a topic. Malhotra (2004) further suggested expert opinion, related literature and open-ended questions as methods to improve content validity. In this study, attention has been paid, during the development of the questionnaire, to attain content validity. The measurement tools in the literature have been considered carefully and open-ended questions were used in the questionnaire.

Construct validity refers to the extent that a measurement scale correlates with theoretical constructs. Construct validity can be measured using convergent validity and discriminant validity. Bollen (1989) suggests the use of goodness-of-fit measures in SEM for confirming construct validity. Convergent validity examines the correlation of similar constructs. Convergent validity was assessed by examining factor loading, composite reliability and the AVE of each scale (Fornell and Larker, 1981). In contrast, discriminant validity measures whether two constructs are different as well as examining the interrelationship of the two constructs. Bagozzi *et al.* (1991) proposed the SEM technique to test discriminant validity. Discriminant validity is achieved when the square root of AVE for each scale is larger than the inter-scale correlation (Barclay *et al*., 1995). The summary of validity measures can be found in Appendix C5.

4.10.4 Limitations of the Questionnaire

While there were benefits in distributing a survey via questionnaires, the limitations were also prevalent during the study, which include:

- Inappropriate sampling may lead to a lack of quantifiable and generalisable findings (Wunsch and Gades, 1986).
- The data collected may lack detail and depth regarding the phenomenon being studied.
- In regard to response, there can be a low response rate, a high response bias and lack of accuracy in the responses from the respondents (Bell, 1996).
- It may be unable to capture in-depth information and different perspectives of the respondents. Some variables of interest can be missed and remain unmeasured.
- There is a high possibility of respondents having different perspectives in regard to the questions (Brady, 1985).
- The data analysis requires adequate skills in statistical methods, sampling and interpretation of data.
- Inappropriate selection of approach is possible between cross-sectional surveys and longitudinal surveys.

4.11 Ethical Considerations

An important aspect for academics and the conduct of their research is the research ethics (Wells, 1994; Churcill, 1995). Ethics is underpinned by moral principles and values that entail the research. Ethical consideration, according to Bryman (2004) must:

- Avoid any kind of force upon participants;
- Reject any kind of deception to gain data;
- Ensure confidentiality and anonymity of the results collected;
- Involve only participants who consent fully.

This study has adopted several measures to address the ethical considerations in line with Curtin University's ethical guidelines. Although this study was conducted in a low/minimum risk area, the ethical clearance has been sought and approved (approval number HR31/2013). This ethical clearance aims to ensure that all involved participants in this study are not put into any situation of risk or harm (Fisher, 2007). This also focuses on:

- Informed consent (Wells,1994);
- Risk to privacy and confidentiality (Bryman and Bell, 2007);
- Risk of harm to participants or related subjects (Fisher, 2007).

Having acknowledged the significance of ethical clearance during this study, the following points will be assured:

- The involvement of participants will be voluntary. There will be no attempt to force or pressure any participant, neither by any kind of inducement nor by payment;
- As this study involves participants from public organisations, all information will be completely confidential and anonymous. If requested, interviewees will be provided with a copy of the interview consent for their records;
- Participants will be informed that information and data, including electronic data, will be kept for a minimum period of five years after the data of thesis publication. It will be stored with adequate supervision in a safe and secure location on computer hard disk and compact disk, or similar, for back up purposes. At the end of this period, all data will be destroyed. Only the student and the thesis committee will have access to the data;
- The research will be conducted in adherence with the ethical research guidelines provided by Curtin University and the thesis committee.

4.12 Chapter Summary

This chapter has discussed the methodology adopted in this study. The justification behind the adoption of methodological triangulation using both quantitative and qualitative methods has been presented. The triangulation has been detailed, in which case studies are incorporated with semi-structured interviews and a survey questionnaire. This chapter also has described the sampling techniques and selection of participants, as well as the details of procedures for semi-structured interviews and survey questionnaire data collection and analysis. Following that was a brief description of the three phases of Structural Equation Modelling (SEM) for the

quantitative data analysis. The chapter concluded by considering reliability and validity, limitations and ethics. The next two chapters discuss the data analysis and results for the qualitative and quantitative methods, respectively.

CHAPTER 5

ANALYSIS AND FINDINGS OF CASE STUDIES

5.1 Introduction

This chapter presents the analysis and findings of five case studies concerning public sector e-procurement adoption. The data presented was obtained from interviews and documents provided by the case organisations. Interviews were conducted with selected respondents from each case organisation, the details of which, including the transcripts and the coding, are provided in Appendix D1. In addition, complementary sources were used for this research, in the form of documents derived either internally from case organisations, such as official websites and reports, or externally acquired from related articles, papers and reports.

For the purpose of this study, the research objects are government organisations that have been adopting the e-procurement system developed by the National Procurement Agency of the Indonesian Central Government over more than one year. The organisations selected were one central government institution, three city/regency branches and one state-owned (public) university's e-procurements services unit. Given the large coverage of area in Indonesia, the selection of locations needed to represent the regions both within Java and outside Java Island. Therefore, the locations selected were Jakarta, Surabaya City, Makassar City, Majene Regency and the State University in Makassar. The distribution of cases can be seen in Figure 5.1. The findings from the case studies are presented separately and structured in the following order:

1. Organisation 1: Central Government, Java-based
2. Organisation 2 : Local Government, Java-based
3. Organisation 3 : Local Government, base outside Java
4. Organisation 4 : Local Government, based outside Java based
5. Organisation 5 : State-owned University, based outside Java based

Figure 5.1 Location and Distribution of Case Organisations

This chapter is divided into sections, each following a similar pattern. Each case organisation is firstly introduced for 'within-case analysis'; this overview of each case organisation provides information about the current state of e-procurement adoption at the time of the study. Following that, case by case, the organisations' data are divided into sections according to the model proposed in Chapter 3, with particular attention being paid to the four areas: benefits, costs, risks and success factors of e-procurement adoption. Finally, the last section of this chapter presents cross-case analysis to compare the commonalities and contrast the differences among the five cases.

5.2 Within-case Findings of Studies

It was found that all the case organisations had been relying solely on informal methods to assess e-procurement adoption within their organisations. None had used any formal evaluation methods; rather, they depended on internally generated reports, internal audit documents, minutes of regular meetings and procedural guidelines provided by the organisations themselves and used to benchmark performance. This suggests that evaluation of e-procurement is an under-developed, under-managed and under-utilised area within the Indonesian public sector. Unlike the private sector, the public sector is considered to be non-profit making and service-oriented. So, it is arguable that the deployment of e-procurement should be aimed primarily to improve service deliveries to the public, rather than to deliver financial benefits to the organisations. In all of the cases studied e-procurement

adoption was initially implemented as a result of statutory requirements, regulated by the president and central government and mandated in response to the political objectives of the government. Therefore, the methods are characterised as non-interactive, hierarchical and bureaucratic. However, current demands from the public for modernisation and improvement has raised awareness of the importance of evaluating public sector investments, which includes e-procurement initiatives.

Next section presents the findings and discussions from an *ex-ante* evaluation of five cases of successful e-procurement adoption, considering benefits management as well as the identification and management of costs, risks, and success factors.

5.3 Case Study 1: Central Government

The first case organisation selected is a central government agency based in Jakarta, established in 2007.This organisation is the regulatory body that performs planning and formulation of policies and strategies for public procurement in Indonesia. The organisation has been promoting public sector e-procurement nationwide, including preparation of guidelines, procedures and manuals for e-procurement. The case organisation is responsible directly to the president and coordinates with the National Development Planning Ministry (BAPPENAS).

The establishment of this organisation, in 2007, had a significant impact on e-procurement adoption within the public sector of Indonesia, accelerating its adoption nationwide by creating e-procurement units (before and hereafter referred to as LPSE) and developing an e-procurement system targeted at the public sector (before and hereafter referred to as SPSE). Each LPSE unit has an associated Procurement Unit (before and hereafter referred to as ULP) that specialises in the use of the SPSE. As a result of this supporting structure, there has been significant deployment of e-procurement adoption since its first introduction in 2008. To date, there are 1,220 e-procurement units throughout Indonesia. The number of transactions via e-procurement also has increased significantly.

To obtain a balanced view, the selected interviewees were sourced from different positions and levels, but all were involved in e-procurement activities within this organisation. Details of the three government officials who participated can be found in Appendix D2. The following sections describe the findings, which also will be utilised in the cross-case analysis and were used to refine the proposed model.

5.3.1 Benefits

The three interviewees were asked to identify and to evaluate e-procurement benefits in their organisation. Analysis of their responses showed that ten clear benefits of adopting e-procurement emerged (Appendix D2). One of the primary benefits noted was that e-procurement had generated savings through reduction of costs by around 10-15%. These savings were attributed to paperless transactions, thus reducing the need for printing and photocopying, publication and documentation via newspapers, other stationery and delivery services. These paperless transaction savings also apply to bidding contractors, resulting in more competitive bids. This then results in associated savings on earnings retained from projected (ceiling) budget allocations compared with actual contracted budgets. Interviewees also highlighted the improvements in the processes themselves and time saved as perceived benefits of using the system.

> "..There has been significant saving - around 10-15% - by utilising the e-procurement. This comes from saving on the earning retained from budget allocations against contracted budget…paperless activities and documents. We can reduce operational costs of manual transactions, like printing, delivery services and transportation and many more costs." (LKPPSUG)

Notably, public organisations are required to utilise the system for public procurement of goods and services. This also aims to encourage the use of e-government solutions like e-procurement. It can assist the government to enhance and improve its services and to interact with stakeholders through public involvement and education.

> "There is also need to improve public awareness of the solution. Since this is a new technology solution and there has been limited information, knowledge of e-procurement seems to be limited to the government officers, specifically the procurement committee and vendors (LKPPSUG)".

The reform of procurement over the last ten years has led to the use of e-procurement for governmental purchasing, with the aim of improving the accountability of public procurement, leading to good governance. The use of internet systems has enabled the public to have open access to opportunities and information in regard to procurement activities. This transparency and openness of procurement was found to be important because it provides a wider span of control and a wider field of opportunities, in addition to the convenience of procuring online.

> "The main power of this system is the transparency that leads to improvement of accountability. This also supports good governance which means improvement of service to the public (LKPPIKA)."

Importantly, the impact of e-procurement on corruption within public procurement was found to be crucial because public procurement had long been vulnerable to corruption in Indonesia (Jasin, 2008). Larasati and Watanabe (2011) supported this view by estimating the reduction in corruption to be in the range of 30% to 50%. Likewise, the Indonesian Corruption Eradication Commission (2013) reported that 77% of cases in court related to corruption within public procurement. As e-procurement offers greater transparency and openness, it supports fair competition and conduct in the procurement system. This transparency also has the potential to reduce indiscretions in practices that often lead to corruption. Such a system also has the potential to reduce bribery and corruption because it minimises direct contact and interactions between suppliers and procurement officers. This reduces the possibility of officials manipulating the results of the tendering process, as was identified by a senior officer:

> "As we all know from the Commission of Corruption Eradication, a large percentage - to about 70% - of corruption was derived from the procurement area. This is our concern to overcome this issue. It is important to minimise the interaction and intervention between the vendors and the procurement committee. E-procurement enables this feature. The same thing also applies in minimising the collusion in the tender processes (LKPPSUG)."

5.3.2 Costs

Organisations should be aware of the costs associated with e-procurement adoption. As the investment for e-procurement is relatively significant, it is important to identify, manage and evaluate the costs (Wirtz *et al.,* 2010). There are four categories of costs associated with e-procurement adoption (Appendix D2) which emerged from the interviews.

Investment on infrastructure was clearly identified as an associated cost, which pertains to hardware and software, servers, the network and internet connections. However, the level of investment is flexible and subject to the abilities and the levels of use of the organisations. Thus, prior to adoption, organisations need to evaluate their technological infrastructures to ensure adequate support and successful use. Costs also arise from operation and maintenance, including expenses for procurement units such as utilities, stationery, printing and internet connections, as well as system updates.

> "There must be significant costs of investments, majoring in infrastructure. There are also costs for internet connection, server and networking (LKPPSUG)".

Notably, training and human resource development also is considered significant. As e-procurement had just recently been introduced for this case, intensive and regular training was crucial to better understand the system, not only for the procurement officers, but also for the providers and stakeholders.

> *"*In regards to human resources, the focus is on strengthening the users all over Indonesia. There is also a specific issue on upgrading the administrator of the system, as this technology is not a common application (LKPPSUG)".

Consideration also was given to the social impact of e-procurement. One prerequisite for successful adoption is improved awareness and acceptance of the system. Public involvement would be beneficial in this context. The next section discusses the risks of e-procurement.

5.3.3 Risks

Interviewees were asked to reveal the major risks of adopting e-procurement that should be considered during the *ex-ante* evaluation process. As a result, ten types of risk were identified (Appendix D2). Initially, security of information and transactions had been identified as the most significant risk. E-procurement is vulnerable to security and privacy of information breaches during transactions, for instance, unauthorised access and data loss caused by fraud. Hence, it is crucial to ensure the reliability and trustworthiness of transactions within the system.

> "I think, like any other sophisticated IT application, they are subject to security risks (LKPPSUG)".

Interviewees also were concerned with issues relating to the lack of knowledge of the system, both on the part of the users and the vendors. Organisations, therefore, need to identify the expertise required for e-procurement. The inability of procurement officers and supporting staff to fully utilise the system will hinder its potential benefits. Additionally, issues on system compatibility with other e-government systems, exacerbated by the need for regular software upgrading, were highlighted. Likewise, there are possibilities of human failure and system errors that may impact the ability of the public sector to effectively engage in e-procurement. This, for example, may arise due to the inappropriate design of hardware, the use of unlicensed software, or the malfunction and damage caused to physical facilities (as a result of lightning strike, for example) that can disrupt the system's performance.

Notably, significant funding support is required for investments in infrastructure and human resource development, as well as operational and maintenance costs. The cost factors of e-procurement have led to higher possibility of funding risks, as reflected from the following response:

> "This requires significant investment in infrastructure, human aspects and funding. These have been classic risks that happen enormously to organisations or locations with limited funding ability (LKPPSUG)"

Further findings revealed the likelihood of risks both internal and external to the organisation. E-procurement requires many changes in organisational structure and

re-engineering of processes. Accordingly, issues may arise from changes in the organisational structure necessary to suit e-procurement adoption. Resistance from internal users and external partners also may jeopardise the uptake of e-procurement. For instance, officials or users may resist learning and using the new system for many reasons, including fear of being replaced by the automated systems. Externally, vendors may question the benefits gained and efforts required to put their businesses into the system. Obviously, it requires extra effort for organisational behaviour to change in order to adopt e-procurement. This case organisation also experienced personnel shortfalls and lack of expertise, leading to an inability to use the system properly.

> "I think the major risks are the low level of acceptance. This relates to the lack of knowledge, or possibly resistance, from the stakeholders (LKPPIKA)".

More importantly, public procurement reform is not merely the switching of procurement to an online form; it also means reforming the current legal framework to support e-procurement. As a result, there has been a sentiment expressed concerning the risks surrounding the legal aspects of governing e-procurement. Particularly, the concern is that centrally derived regulations can be subject to multiple local interpretations of the legal aspects.

5.3.4 Critical Success Factors

Interviewees were asked to identify the critical success factors of adopting e-procurement. The findings revealed nine factors that influence successful e-procurement uptake (Appendix D2). Notably, four major factors were identified relating to the legal aspects, human resource development, the commitment of stakeholders and system development. The Indonesian government has taken steps forward by adopting e-procurement for public purchasing. The legal ground for e-procurement adoption has been developed and has resulted in a more solid foundation for e-procurement policy. The presence of these legal and regulatory forces means that all organisations have to conform to the accepted standards and rules to achieve successful use of the system.

Another important finding advocates that successful adoption is underpinned by developing human resources through continuous training. Technology alone cannot provide a solution; it must be accompanied by personnel that are trained properly.

> "In the future, public procurement will be fully via electronic means. As a consequence, it requires development of human resources (LKPPIKA)".

Commitment and support from stakeholders, especially the decision-makers, in regard to e-procurement adoption is crucial. This also must include support from central government in order to address the importance of technology and system development. An underlying factor that enables successful uptake also can be the ability of the organisation to develop proper technological infrastructure to support the system.

> "I also think system development is an important factor, for instance, system upgrades and user friendly applications. These are an on-going process and we are expecting an advanced system (LKPPSUG)".

Comprehensive communication and good coordination between users and vendors were found to foster confidence and trust in the system. By communicating all matters related to e-procurement, all players can achieve greater commitment and a clearer picture, as illuminated by a senior manager's response.

> "It requires approaches, assistance and synergy for successful adoption by all stakeholders (LKPPIKA)".

It also was found that successful adoption requires organisations to redefine their procurement processes, structures, behaviours and ways of dealing with partners. It was suggested that public involvement in the early stages is crucial to provide feedback on areas that require improvement. The importance of public acknowledgement cannot be underestimated because this fosters transparency and improved public opinion towards public e-procurement.

> "…the support and involvement of community is also important. The people have become the agent of control and the agent of change for successful e-procurement…The development of e-procurement also utilises community development and society's approach to introducing the system (LKPPIKA)".

5.4 Case Study 2: Local Government

The second case organisation is a local government organisation based on Java Island and was the pioneer of public procurement reform when it introduced the first public e-procurement system in 2002. The organisation successfully built up a system called the Surabaya Procurement System, which incorporated the best practices from e-procurement systems in Hong Kong and Singapore. During the period from 2004 to 2008, the system used semi e-procurement through which some procurement documents were handled manually. The system was modified and upgraded, then finally migrated to the national system of SPSE as a full e-procurement system in 2008.

Since the introduction of the e-procurement system, results have been both positive and prevalent within the city, generating savings in public procurement alongside numerous other benefits. Following these successful results, the organisation also promoted the system and provided assistance to other local governments in Indonesia for its development. In the case organisation, e-procurement is being managed by the LPSE Service Providers as systems administrators and the procurement unit acts as the procurement committee. The unit consists of 42 staff, with the head of the unit as the manager, supported by a vice manager, secretary and 39 procurement officers. The procurement officers are divided into 13 work groups, each of which is divided into sub-working groups: five groups are responsible for managing the construction projects and purchasing of goods, while three groups are in charge of consulting services. They are also fully supported by twenty supporting/contract staff. The structure of the organisation can be seen in Figure 5.2.

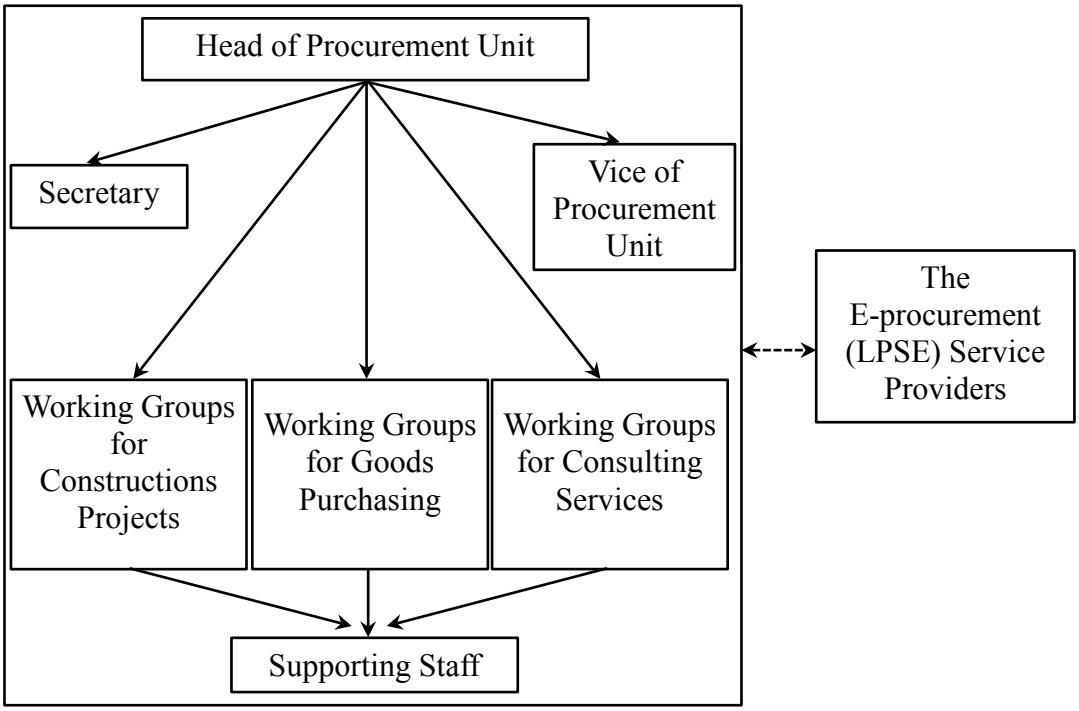

Figure 5.2 Organisational Structure of Procurement Unit

Since the introduction of the system in 2012, the results depict significant savings in procurement, accounted at 21.5%. During the period of 2012-2014, there were 2,113 tenders procured through the SPSE system.

Table 5.1 Details of E-Procurement Activities (2012-2014): Case Organisation 2

Total Tenders	**Number of Tenders Awarded**	**Amount of Tender Ceiling (Million Rupiahs)**	**Total Cost of Contracts (Million Rupiahs)**	**Saving (Million Rupiahs)**	**Percentage of Saving (%)**
2,113	1,992	2,832.888	2,225.095	607.794	21.45

Source : LPSE Smart Report

In the case organisation, 13 interviews were conducted at the procurement unit office. The interviewees were managers and staff of the procurement unit, with selection taking into consideration their working experiences, training attended and availability of time for interviews (Appendix D3).

5.4.1 Benefits

Thirteen major benefits of e-procurement, based on the interviewees' experiences utilising the system, were identified (Appendix D3). Notably, the establishment of the procurement unit aimed to promote transparency and openness. The results indicate that the system led to increased opportunities for small and medium enterprises (SME) to participate in the bidding process. In fact, a higher percentage of the projects were won by SMEs after its introduction, indicating fair competition through the system's use.

An underlying added value of the system was the generation of savings of up to 21.45%. These savings were accrued from cost reductions through paperless transactions, particularly savings from printing and documentation of the tender documents.

> "As a consequence, it generates savings in many ways, for instance, paperless documents. Saving on the budget allocation is also significant; it is the earning retained from budget allocations against contracted budget (SBYAAR)."

As the system was implemented in various public entities across Indonesia, it became possible to benchmark efforts and to reduce the potential for corruption, collusion and nepotism in public procurement. E-procurement has been an effective means of decreasing the interaction between procurement committees and vendors. This prevents further opportunities to manipulate the results of procurement from within both internal and external organisations. This also minimises possible unethical affiliations and misconduct in procurement, which is recognised as common practice in conventional procurement.

In addition, the openness of the system enables the procurement committees and vendors to monitor and evaluate the tender processes. This results in improvement in the auditing of transaction processes, which can lead to improved accountability. Likewise, an e-procurement system enables the public to monitor the system, which engenders trust and confidence, and curbs the negative stereotypes that traditionally undermine public procurement. It also enables easier access to officers to manage

and monitor the procurement process, as well as to the vendors lodging tender bid documents who can simply log in to the system from anywhere at any time. This has led to efficient and effective procurement processes in terms of time, costs and resources used.

> "This may improve the efficiency both in time and costs (SBYAGR)".

System security has always been a major concern. However, the use of digital signatures, the deployment of authentication procedures and the encryption of documents in association with the National Coding Agency have been introduced to ensure system security.

> "I can consider that the system promotes the principles of openness, transparency, accountability, efficiency, efficacy and security of the procurement process (SBYBRI)."

Finally, the significance of the existence of standards and procedures for public e-procurement was identified, particularly since they are widely available and accessible through the system and they are applicable nationwide.

5.4.2 Costs

The study of this case organisation has successfully identified four major costs incurred from e-procurement adoption. The interviewees identified them as: operational, maintenance, training and human resource development. As the unit is an independent unit, there have been significant costs for the operation and maintenance of the system, including such costs as stationery and expenses for the secretariat. Costs of maintenance included expenditure on internet connections, servers and system upgrading. Likewise, expenses for human resource development can be considered significant. Undoubtedly, significant costs arise from infrastructure investment.

> "Obviously, there are also costs of infrastructure and equipment like the server, LAN, wireless and internet access." (SBYAAR)

In order to raise the work motivation and morale of the officers, funds also were allocated for rewards, incentives and a salary scheme. Related expenses also arose from contract staff salaries and outsourcing services.

5.4.3 Risks

This case organisation had experienced various risks during the ten year period of adoption. The findings reveal ten possible risks that affect e-procurement adoption (Appendix D3). Prior to the current LPSE system, the case organisation had developed and utilised its own e-procurement system called 'Surabaya Procurement'. In 2010, the system migrated to the LPSE system developed by LKPP. During this period of transition, they experienced risks associated with system integration from the previous system to the new system.

Another technological risk pertains to security of information and transactions. Specifically, they were subjected to attempts of threat from hackers, as mentioned by a senior procurement officer:

> "There are possibilities of threat on the security of the system… We were also experiencing threats of hackers in 2011 (SBYAZI)".

Notably, there also was the likelihood of system failure caused by human error, server crashes and network errors. Concerns regarding internet connections and the networking system also were prevalent. In fact, the current server is utilised by other e-government applications, which means that the system is limited by sharing services. In regard to human error, lack of knowledge of the system was the contributing factor. There should be intensive training for users and vendors, as well as public involvement, to utilise and monitor the system. Additionally, there were found to be numerous human-related risks such as possible misconduct and collusion between procurement officers and vendors. Thus, continuous monitoring and evaluation of the processes by the head of the unit was necessary.

> "There is a likelihood of risks that are related with the system, network and human resources (SBYSHO)".

Regarding legal aspects of the system, the use of the current system is regulated under the Major Decree of Surabaya number 188.45/481/436.1.2 year of 2013. There should be continuous reviews and further regulation governing specific types of transaction.

5.4.4 Critical Success Factors

Although facing many challenges during the early period of adoption, this organisation eventually managed to take full advantage of the system. From their experiences, the officers interviewed identified ten crucial factors that positively affected its adoption.

Two factors were profoundly central to successful adoption: human resource development and commitment from stakeholders. Human resources have always been the priority of this organisation. As a result, extensive training for the procurement officers and supporting staff are regularly conducted to maximise the potential of the system. Development of human resources has received full support and commitment from the managerial level of the organisation. Sufficient funding for infrastructure investments, as well as operational and maintenance issues, also have been provided to support e-procurement delivery. Another enabling factor was adequate technological support and system development. Beside such technological matters, changes to organisational structure to support e-procurement functions were found to be important.

> "…crucial factors are commitment and support from the top managerial level, and human resources development (SBYDWI)."

Further support comes from stakeholders' involvement in monitoring the system and personnel of the unit. Effective communication lines and coordination of all stakeholders was essential in this matter.

> "I can point out many supporting factors. They are good coordination with stakeholders, top leader support, human resource development, stakeholder awareness and involvement, and allocated funding (SBYDID)."

Notably, the importance of central government was found to be crucial to support the development and penetration of the system to all government entities. This also included the development of supporting regulations to strengthen the efforts of e-procurement adoption in Indonesia.

> "I believe the following factors may affect successful adoption, for instance… regulation support, and support from central government (SBYENI)."

5.5 Case Study 3: Local Government

The third case organisation is a local government organisation located outside Java Island. It is located in a fast-growing region that has been central for business and trade, industries, education and health services, and is a node for transportation to the eastern area of Indonesia. In this case organisation, e-procurement was firstly introduced in 2007, after consultation with BAPPENAS. Together with another five cities, it was selected for a pilot project of e-procurement in a partnership programme supported by BAPPENAS and the United States Agency for International Development (USAID). The actual implementation of the e-procurement system was commenced in 2008. The mayor of Makassar assigned 17 procurement officers to manage the e-procurement activities. To date, however, the structure of this organisation consists of working groups that are attached to all institutions. These working groups have the same functions as an e-procurement unit but with a smaller structure. For the purpose of this study, the working groups selected were those from within the public works department. The LPSE unit also was included, in order to acquire a better understanding of e-procurement adoption within the organisation. The structure of this case organisation is illustrated in Figure 5.3.

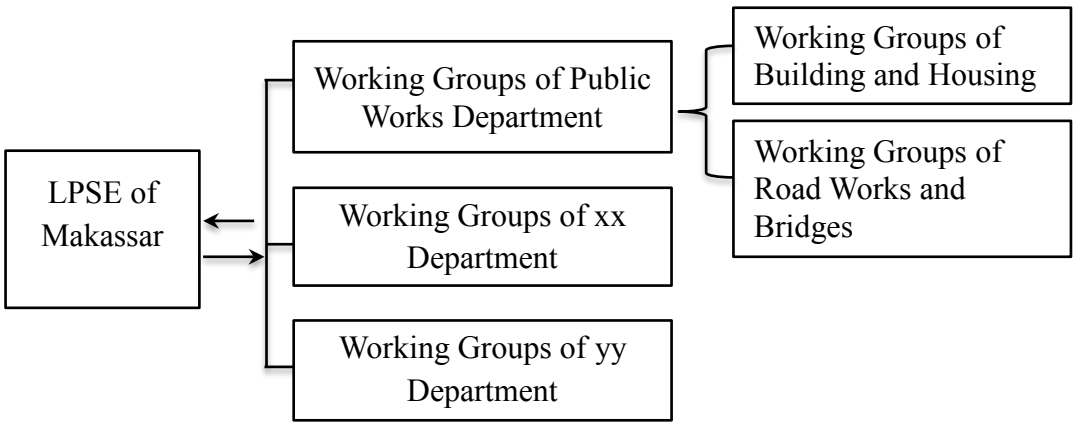

Figure 5.3 Structure of E-Procurement Working Groups

Rapid use of e-procurement can be seen from the increased number of projects and the funding allocated from year to year. Notably, the use of the e-procurement system generated savings that account for 5.07% for the period of 2012 to 2014. There had been 489 projects procured via the SPSE system (Table 5.2).

Table 5.2 Details of E-Procurement Activities (2012-2014): Case Organisation 3

Total Tenders	**Number of Tenders Awarded**	**Amount of Tender Ceiling (Million Rupiahs)**	**Total Cost of Contracts (Million Rupiahs)**	**Saving (Million Rupiahs)**	**Percentage of Saving (%)**
489	481	562,499	533,988	28,511	5.07

Source : LPSE Smart Report

A total of 14 interviews were conducted at the workplaces of the procurement working group of the public works department and at the LPSE unit secretariat, including people from a range of positions (Appendix D4).

5.5.1 Benefits

This case organisation had been acquiring a wide range of benefits from e-procurement since its first adoption (Appendix D4). It was highlighted that e-procurement provides a transparent system and offers openness to its procurement

activities. Compared to manual procurement, e-procurement enables procurement officers and vendors to access all information and to monitor the tender process online. Consequently, the open access to procurement processes supports fair competition between vendors. This can be seen from the fact that the number of vendors who participated in tender processes increased considerably and most of the winners were locally-based vendors.

Additionally, paperless procurement can save the expenses of printing, copying, documentation and delivery of manual tender documents. Further savings of up to 5.07% were generated from the difference between actual contracted costs and the budget allocation. Other savings come from better time management and reduction in the timeline of tender processes because all documents are submitted directly into the system. Obviously, this improves both the efficiency and the efficacy of procurement processes.

> "It also promotes efficiency and generates saving in many areas...minimises the costs and timeline of procurement (MKSSUR)."

Undoubtedly, e-procurement also has been an effective means to minimise potential corruption and affiliation between procurement officers and vendors. Likewise, e-procurement has contributed in reducing the possibility of intervention in the tender results because there is no direct interaction between officers and vendors. Moreover, the system provides protection to the transactions and documents from the possible effects of malware and the threat of hackers. There has been a significant improvement in the security aspects of the system so far.

> "It also minimises the potential threat of corruption and collusion in the tender process by providing transparency and less intervention and contact with external parties (MKSASR)".

Finally, there are implications for the system leading towards positive public opinion: a level of trust in the system was acknowledged to make public procurement more accountable and trustworthy. Following on from this point, the involvement of

all stakeholders, especially the public, may raise awareness and enable public control over tender activities.

5.5.2 Costs

There has been rising awareness of the five cost variables in this case organisation (Appendix D4). As expected, there have been significant ongoing operational costs for the unit. Those costs were derived from the operation, maintenance and upgrade of servers, internet connections and administrative expenses. The case organisation also had invested significantly on infrastructure development to support the unit. In addition to that, funding was allocated for human development through regular training. Further funding support was allocated to the provision of rewards, incentives and operational salaries for procurement officers and contract staff.

> "Most costs of e-procurement are operational, human resources, incentives and infrastructure expenses. There are also costs of the internet and networking (MKSSUR)".

Importantly, the case organisation also was experiencing immense changes to its way of performing services, including restructuring their organisational procurement framework from a paper-based to a fully online system.

5.5.3 Risks

A total of 12 typical risks that have the potential to jeopardise e-procurement adoption were recognised. Both failure of the internet and the system itself were the foremost threats. In most cases, the procurement officers and vendors had experienced failure to upload and download documents due to the low bandwidth of the servers and downtime of internet services. The current server is a shared service with other e-government applications within the city of Makassar.

Additionally, funding support for operational items, maintenance and upgrading of the current system is another risk consideration. Technologically speaking, another concern of the system relates to security risks of transactions and information

through e-procurement: they were also experiencing threats from hackers. Consequently, that could endanger the time schedule of the procurement process.

Human-related risks also had been found to be crucial, for instance, risks of failure caused by human error. Lack of IS/IT knowledge and the e-procurement system also contributed to the failures. Additionally, they were facing higher staff turnover during the early period of adoption.

> "The human resources factors are also subject to risks. It also covers the staff turnover and human error risks (MKSAMR)."

Further, there was a lack of support from decision-makers to upgrade the existing working groups from various departments into a centralised procurement unit. There should be regulation of the establishment of functioning e-procurement units. Likewise, the system needs full support from all stakeholders to overcome the possibility of resistance to e-procurement.

5.5.4 Critical Success Factors

A number of factors were highlighted by the interviews to bring about successful e-procurement use (Appendix D4). There are four major factors related to investment that were crucial for successful adoption. They are investments in human resources development, infrastructure, operational and maintenance items, and further technological development of the e-procurement system, all of which require significant funding allocations. Likewise, changes in both structure and culture to fit the adoption processes were critical.

Factors related to stakeholders were acknowledged as important to e-procurement deployment. There should be strong commitment and full support from all stakeholders, especially from the top managerial level. Such support can be achieved through good communication, coordination and, if required, more opportunities for stakeholder involvement in the system. The support of stakeholders will strengthen the use of e-procurement and its further development. Further support may come

from central government and local government by reinforcing regulations when administering e-procurement.

> "…the following factors for successful adoption. They are coordination with stakeholders, infrastructure, human development and training, organisational structure, and operational funding supports (MKSASR)."

5.6 Case Study 4: Local Government

The fourth case organisation selected is a local government organisation located outside Java. It is in a medium-sized regency in the eastern part of Indonesia that is part of a newly expanded province in the western part of Sulawesi Island. It is located on the coastline of the Trans Sulawesi railway line between South Sulawesi and North Sulawesi and has been one of the connector ports to Kalimantan Island. E-procurement was introduced in 2011, after intensive consultation with the LKPP. Initial preparations also were conducted by coordinating with the nearest LPSE of South Sulawesi province and the regency of Luwu Utara, which had implemented the system earlier. After one year of preparation, e-procurement was deployed in 2012. As a result of taking three years to achieve full adoption, the organisation is experiencing spectacular results, with significant savings in procurement being accounted at about 11.64%. The trend for tenders procured increased every year and all projects were procured online in 2013.

Table 5.3 Details of E-Procurement Activities (2012-2014): Case Organisation 4

Total Tenders	Number of Tenders Awarded	Amount of Tender Ceiling (Million Rupiahs)	Total Cost of Contracts (Million Rupiahs)	Saving (Million Rupiahs)	Percentage of Saving (%)
91	57	47,468	41,945	5,523	11.64

Source : LPSE Smart Report

In this case organisation, the departments assigned to provide e-procurement support were the LPSE service as the administrator of the system and the procurement unit services as the procurement committee. The LPSE service consisted of 10 staff

members and was subdivided into the functions of system administrator, helpdesk officer and verification officer. Meanwhile, the procurement unit consisted of 25 certified procurement officers and was divided into four working groups that handled goods purchasing, construction, consultancy and other services. The hierarchy of the organisation can be seen in Figure 5.4. For the purpose of this study, five interviews were conducted with the officers at the procurement unit and the LPSE unit (Appendix D5).

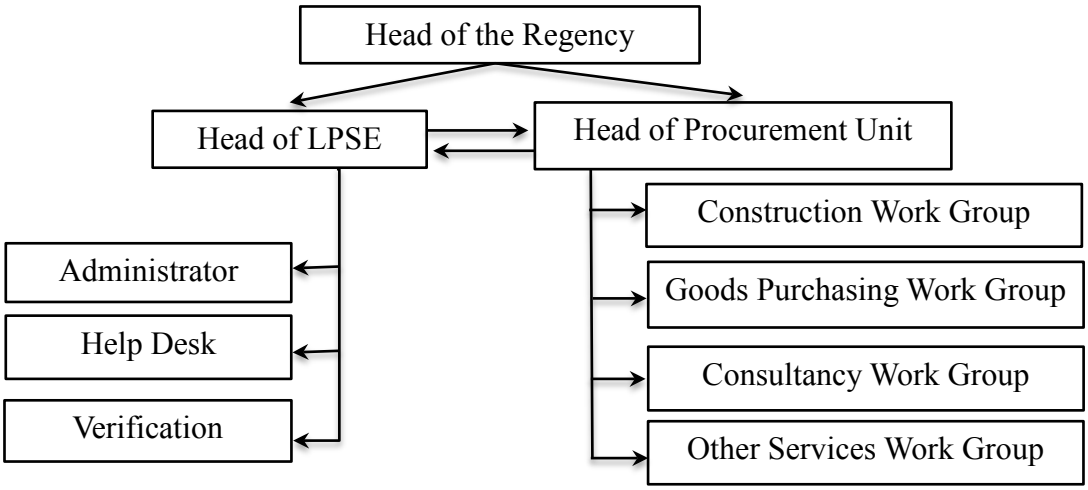

Figure 5.4 Structure of E-Procurement Unit of Organisation

5.6.1 Benefits

The results of the interviews depicted a wide range of advantages for e-procurement adoption (Appendix D5). On the top of the list is the saving generated by the reduction of costs via paperless transactions and the difference between actual contract value and the budgeted tender ceiling of up to 11.64%. In addition, paperless tenders support efficiencies in the budget use of public entities. Additionally, respondents had experienced ease of use of the system because it enabled online access at any time and from anywhere. Online procurement is an effective means to reduce the tender timeline when compared to manual tendering.

Another benefit was the reduction in direct contact between procurement officers and vendors, which potentially minimises affiliation and corruption during tender

processes. Indirectly, it protects the procurement officers from the interventions and pressures of other parties that may attempt to arrange particular tender results.

> "…the most important emphasis here is the higher chance to minimise any kind of 'cheating' and affiliation between the procurement officer and providers or contractors in procurement (MJNROS)".

Online tendering also facilitates open and transparent access to all tender information, so that everyone has the opportunity to monitor and to control tender activities. This also supports the fair conduct of tendering because participating vendors can track their progress. While supporting open access to information, the system also ensures security and confidentiality of transactions by authentication and validation of all information with the vendors.

> "…enables people to access the information. I can say it is the transparency. In addition, it also enables openness of the system as everyone has the opportunity to lodge a tender offer (MJNILH)."

5.6.2 Costs

In this case organisation, the costs incurred from e-procurement adoption were identified. The foremost costs were for the resources required for infrastructure investment, operations and maintenance, and human resources development, which were fully covered by the local government budget. Likewise, an incentive scheme was established to increase staff motivation for the additional work. However, limited funding support may have impeded the adoption process.

Another concern related to the importance of ensuring the acceptance of the system by the public. Therefore, expenses were allocated to provide intensive familiarisation during the introductory stages of e-procurement to the public.

> "Another type of cost is the social costs. It means the cost to introduce the system to the public. This refers to the socialisation costs (MJNROS)".

5.6.3 Risks

As in other organisations, risks that could hold back e-procurement adoption were numerous. Risks of failure of the system and internet contributed to the inability to deliver the maximum benefits of e-procurement. Such failure also led to excessive time required for troubleshooting, resulting in late deliveries and poor performance of the system. Likewise, the ability of the LPSE system to exchange information and link with other LPSE systems was considered to be risky.

> "We are experiencing technical issues and risks, for instance, server errors, system errors or network errors (MJNROS)."

In addition, human resources were perceived to be significant risks. From the point of view of human-related issues, lack of knowledge of the system, low readiness level for IT and issues of staff turnover could limit the effectiveness of the system. In relation to that, concern was voiced about the low level of acceptance by the stakeholders, which had hindered adoption. Further risks pertain to laws and regulations governing e-procurement because it is only regulated under presidential decree, which is still debatable due to multiple interpretations of the decree. There should be a formulation of e-procurement law from central government and supported by local government regulations.

5.6.4 Critical Success Factors

Eight primary factors that contributed to successful adoption emerged from the interviews (Appendix D5). The significance of gaining support and strong commitment from the head of the region and top managerial levels was attributed as the foundation for further adoption. Furthermore, three factors related to funding were identified that may trigger further e-procurement expansion. Items that compose these factors include investment in human resource development, infrastructure and operational factors of e-procurement.

> "…infrastructure and human resources are crucial to the uptake of e-procurement (MJNAFR)."

Other success factors refer to the involvement of stakeholders and effective communication with stakeholders to accelerate adoption. This also requires a supportive culture within the organisation, in which everyone is committed to e-procurement. In addition, the existence of legal aspects that become the umbrella of the system was found to be critical for successful adoption.

5.7 Case Study 5: State-Owned University

The final case organisation selected is a state-owned university based outside Java Island. It was the first university to adopt e-procurement in Indonesia. The e-procurement system was firstly introduced to the university in 2008 as a pilot project for e-procurement developed by BAPPENAS. The university finally managed to conduct all of its tenders via this e-procurement system in 2009. The case organisation also develops partnerships and provides support to other public institutions which have initiated adoption of the system. Following the successful adoption, this case organisation was presented with an e-procurement award, in 2012, for being a pioneering institution and for its performance in supporting others.

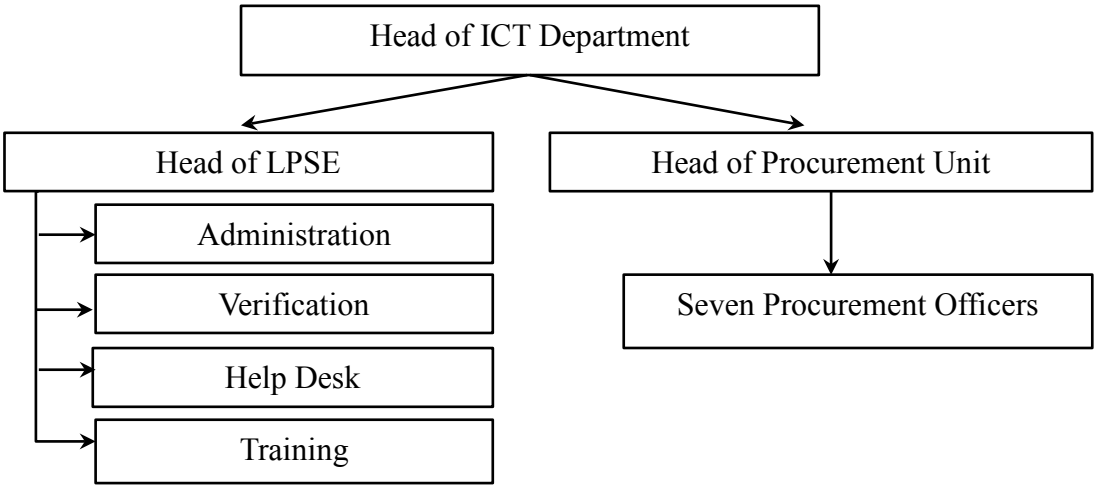

Figure 5.5 E-Procurement Unit Case Organisation - State-Owned University

There are two units responsible for e-procurement; the LPSE unit as the system administrator and the procurement unit as the procurement committee. Both units are under the University ICT department. The LPSE unit consists of five officers who

share the various functions of administration, verification, helpdesk assistance and training, while the procurement unit comprises of seven certified procurement officers (Figure 5.5). Within this organisation, there were only two respondents from the LPSE unit who participated in the research (Appendix D6).

During the period of 2012-2014, there were 317 projects/tenders procured online via its SPSE system. From those projects, there had been savings of up to 6.68%.

Table 5.4 Details of E-Procurement Activities (2012-2014): Case Organisation 5

Total Tenders	Number of Tenders Awarded	Amount of Tender Ceiling (Million Rupiahs)	Total Cost of Contracts (Million Rupiahs)	Saving (Million Rupiahs)	Percentage of Saving (%)
317	311	959,806	894,925	64,881	6.68

Source: LPSE Smart Report

5.7.1 Benefits

At this case organisation, numerous benefits also were identified. Using the system, procurement officers were working in pre-defined roles while the vendors did not have the authority to change tender documents in the tender process. The e-procurement system minimised the potential of fraud, corruption, misconduct and intervention in tender activities. Moreover, with the e-procurement system it is possible to measure and monitor the tender processes and to make it fully transparent because all information and the entire process itself are easily accessible online. Consequently, this improves the accountability of government procurement.

> "As it is an online system, there are no limitations of time and space for procurement activities…Everyone from anywhere can be involved in the procurement… it offers openness and transparency of procurement activities (UNMKAH)".

The automation of processes also increased efficiency and generated savings through paperless transactions and less resources being required. Finally, all those benefits engender trust and awareness of government procurement among the public.

> "…online system, the use of papers is reduced dramatically. Paperless transactions create significant savings… this improves the efficiency of the tender process (UNMZAI)".

5.7.2 Costs

The results of the interviews present two major costs of e-procurement adoption (Appendix D6). Those costs are the expenses for start-up and operational costs. Start-up costs were derived from the initial funding invested for infrastructure, such as a building for the procurement unit office and IT technologies. Meanwhile, costs for operations arise from regular expenses to maintain the system and its supporting components.

> "…spending budget on infrastructure developments, and operational expenses (UNMKAH)".

5.7.3 Risks

The findings also highlighted the critical importance of risk assessment to avoid slow adoption. Four major risks have been identified for further risk management action (Appendix D6). Due to limitations of technological infrastructure supports, the likelihood for system and network failure was found to be significant. These distractions may arise from low bandwidth, power line outages and insufficient internet access.

> *"*There are risks of the system. It includes system maintenance and errors… internet access failure due to low bandwidths. Sometimes, it also relates to the power being down (UNMKAH)".

In addition, lack of system knowledge (SYSKN) could contribute to failure to operate and deliver the system. Another concern addressed the security aspects of e-procurement.

5.7.4 Critical Success Factors

Best practices of successful adoption can be found within this case organisation. Numerous factors have been found to create significant impact on its successful

adoption (Appendix D6). In general, respondents believed the key to its successful implementation was technological, both from internal and external sources. From the technological point of view, investment in information technology infrastructure, operational costs, maintenance and system development are the crucial factors.

> "I believe the following factors are supporting the adoption…training, coordination and communication of stakeholders, system development, human resources development, organisational structure, infrastructure development and top leader support (UNMZAI)".

On the other hand, factors of internal organisation refer to human resources development, appropriate organisational structure, effective communication and support from top leaders and decision-makers. In addition, external factors such as support from central government through comprehensive regulations also are important.

5.8 Cross-case Analysis of Studies

The results from a total of 34 interviews within five case organisations have been presented and explored in the previous sections, highlighting the benefits, costs, risks and success factors of e-procurement adoption. This section aims to analyse and synthesise the findings from across all five case organisations. This includes:

- examining the patterns of findings across the five case organisations; and
- categorising the findings into taxonomies that will be used as the frame of reference for evaluating the proposed model.

5.8.1 Analysis of E-Procurement Benefits

This section presents a synthesis of the electronic procurement benefits identified within the five case organisations. The benefits achieved have been summarised and are presented alongside a cross-case comparison that shows the commonalities and differences in the responses across each of the cases (Table 5.5)

Table 5.5 Cross-Case Analysis of Perceived E-Procurement Benefits

No.	Perceived Benefits	Total Responses		Case Organisations				
		(out of 34)	%	1 (out of 3)	2 (out of 13)	3 (out of 14)	4 (out of 5)	5 (out of 2)
1	Promote transparency and openness	33	89.19	3	11	14	4	1
2	Generate savings and reduce costs	32	86.49	3	10	13	5	1
3	Curb potential of corruption, collusion and nepotism	32	86.49	2	12	12	4	2
4	Minimise interaction and intervention	25	67.57	1	8	11	3	2
5	Efficient and effective procurement processes	20	54.05	1	4	10	4	1
6	Offer easiness	19	51.35	-	7	5	5	2
7	Time saving (time reduction)	14	37.84	-	4	8	2	-
8	Minimise affiliation and misconduct	13	35.14	-	2	6	5	-
9	Improve public opinion and awareness of the system	6	16.22	3	1	1	-	1
10	Support fair competition	6	16.22	1	3	1	1	-
11	Improve accountability	6	16.22	2	2	1	-	1
12	Security and confidentiality of transaction	5	13.51	-	2	2	1	-
13	Provide protection to the procurement committee	4	10.81	-	-	3	1	-
14	Encourage IT penetration and use of e-government solution	3	8.11	3	-	-	-	-
15	Provide national standardisation of documents and processes	2	5.41	1	1	-	-	-

The benefits identified have been classified into the three categories of strategic, operational and tactical benefits, in line with Piotrowicz and Irani's work (2010), as presented in Table 5.6. From the findings, e-procurement benefits are characterised as tangible or intangible (Gunasekaran *et al.*, 2001; Irani and Love 2002) and

financial or non-financial (Irani and Love, 2002). Tangible benefits can be measured quantitatively, most prominently in financial measures, while intangible benefits cannot be converted directly into financial measures. At the strategic level, the predominant benefits were intangible and non-financial. On the other hand, tactical benefits were characterised as tangible and financial. At the operational level, both tangible and intangible benefits were distributed.While there are no major differences between the findings of the interviews and the conceptual model proposed in Chapter 3, closer analysis does reveal some minor variances.

Table 5.6 Taxonomy of E-Procurement Benefits

Benefit Classification	Perceived Benefits	Intangible	Tangible	Financial	Non-financial
Strategic Benefits	Promote transparency and openness	√			√
	Improve public opinion and awareness of the system	√			√
	Improve accountability	√			√
Operational Benefits	Generate savings and reduce costs		√	√	
	Time saving		√	√	
	Minimise interaction and intervention	√			√
	Offer easiness	√			√
	Efficient and effective procurement processes	√			√
	Security and confidentiality of transaction	√			√
Tactical Benefits	Provide national standardisation of documents and processes	√			√
	Encourage IT penetration and use of e-government solution	√			√
	Support fair competition	√			√
	Curb potential of corruption, collusion and nepotism	√			√

Within the strategic benefits classification, the case findings did not indicate any significance of communication and coordination between stakeholders. However, while not presenting as a significant benefit, supporting statements identified this as a key factor for measuring the success of system adoption. Another point worth noting is that there were multiple interpretations by interviewees of what competitiveness

and fair competition entailed, with most respondents identifying them as a single concept rather than two separate and distinct factors. Hence, within the results, improvement in competitiveness would always be accompanied by improvements in fair competition. Therefore, considering the significance of these two benefits within the results, it was proposed that they be consolidated into a single factor for inclusion in the revised model.

Within the operational benefits classification there were two factors that were not directly implied during the interviews, namely staff reduction and public service improvement. However, it was noted from direct observation and informal discussion after the interviews that reductions in staff had occurred in all case organisations. Additionally, the implicit consequence of efficient and effective e-procurement is the resulting improvement in public services, which has received positive responses from the public. As a consequence, both benefits will be included in the revised model hereafter. From a tactical point of view, regulation compliance is deemed crucial because all activities and documents have to meet the legal requirements that include standardisation of documentation, procedures and processes for e-procurement.

Thus, a revised list of determinants was proposed for the model. This revised model then was used to develop the questionnaire to test the proposed model. The revised benefits model can be found in Appendix D7.

Table 5.7 Revised E-Procurement Benefits Determinants

Classification	Conceptual Model	Case Study Findings	Adjusted Model
Strategic	Foster transparency/ openness	Promote transparency and openness	Promote transparency and openness
	Public opinion and awareness	Improve public opinion and awareness of the system	Improve public opinion and awareness of the system
	Improve accountability	Improve accountability	Improve accountability
	Improve communication and coordination	NA	Improve communication and coordination
	Improve competitiveness	NA	Improve competitiveness
Operational	Generate savings	Generate savings and reduce costs	Generate savings and reduce costs
	Reduce costs		
	Shorten cycle times	Time saving	Time saving
	User friendly	Offer easiness	Offer easiness
	Efficient and effective workflows	Efficient and effective procurement processes	Efficient and effective procurement processes
	Security and confidentiality	Security and confidentiality of transaction	Security and confidentiality of transaction
	Minimise intervention	Minimise interaction and intervention	Minimise interaction and intervention
	Reduction in staffing	NA	Reduction in staffing
	Improve public services	NA	Improve public services
Tactical	Provide standardisation	Provide national standardisation of documents and processes	Provide national standardisation of documents and processes
	Encourage IT penetration	Encourage IT penetration and use of e-government	Encourage IT penetration and use of e-government

		solutions	solutions
	Support fair competition	Support fair competition	Support fair competition
	Curb the potential for corruption	Curb potential for corruption, collusion and nepotism	Curb potential for corruption, collusion and nepotism
	Regulatory compliance	NA	Regulatory compliance

5.8.2 Analysis of E-Procurement Costs

A critical review of the e-procurement cost taxonomies from the cross-case findings was undertaken to establish patterns and identify possible corrections to the conceptual model proposed. In light of the cost taxonomy by Irani and Love (2001), the identification of e-procurement costs was categorised into direct and indirect costs.

Table 5.8 Identified E-Procurement Costs

No.	Perceived Costs	Total Responses		Case Organisations				
		(out of 34)	%	1 (out of 3)	2 (out of 13)	3 (out of 14)	4 (out of 5)	5 (out of 2)
1	Infrastructure investment costs	34	100.00	3	13	14	5	2
2	Operations and maintenance	34	100.00	3	13	14	5	2
3	Training and human resource development	26	76.47	2	12	9	3	-
4	Rewards, incentives and salaries for officers	14	41.18	-	6	6	2	-
5	Social costs	4	11.76	1	-	-	3	-
6	Organisational changes	1	2.94	-	-	1	-	-

The findings across all case organisations highlighted six major costs that were incurred from e-procurement adoption, which can be categorised into three common areas, these being technology, people and organisation. The direct costs relating to technology were incurred through investment in infrastructure, as well as human

resource development in the form of training. Direct costs also emerged from the more long-term expense required for the ongoing operation and maintenance of acquired technology. The major direct cost relating to personnel was the additional salaries often incurred through the need for specialist support. The indirect costs of adoption included the social costs of change and the re-engineering of organisational structure. A summary of these costs is shown in Table 5.9.

Table 5.9 Taxonomy of E-Procurement Costs

Type of Costs	**Description**	**Technology**	**People**	**Organisation**
Direct	Infrastructure investment costs	√		
	Operational and maintenance	√		
	Training and human resource development	√		
	Rewards, incentives and salary schemes		√	
Indirect	Social costs			√
	Organisational changes			√

When comparing the findings to the conceptual model, the following similarities and differences were noted. For direct costs, the findings were identical to the model proposed in Chapter 3. In general, the respondents focused on the main costs with little coverage of the detailed breakdown. This could be expected, given that there has been no formal evaluation conducted on costs in the selected cases.

However, the costs of overtime and staff motivation were not identified explicitly during interviews. It was noted that a lack of upfront support for reorganisation would lead to additional overtime being required for inefficient procurement processes. Further, a similar type of cost was identified relating to rewards and salaries for employees, which had a big impact on the work motivation of staff. Automated tasks via the online system forced the staff to adjust their routines and working habits, with the online system also requiring them to be well–trained, with relevant IT knowledge. These costs relating to the motivation of staff are typically indirect because they concern the system impacts on staff.

Table 5.10 Revised E-Procurement Costs Constructs

Classification	Conceptual Model	Case Study Findings	Revised Model
Direct	Infrastructure	Infrastructure investment cost	Infrastructure investment
	IT/Hardware		IT/Hardware
	Human resource development	Training and human resource development	Human resource development
	Operational and Maintenance	Operational and maintenance	Operational and maintenance
	Consultancy support		Consultancy support
	Server and internet		Server and internet
	System development		System development
	Incentives, rewards scheme	Rewards, incentives and salary schemes	Rewards, incentives and salary schemes
Indirect	Social and public	Social costs	Social costs
	Partnership		Partnership costs
	Organisational	Organisational changes	Organisational changes
	Strains on resources		Strains on resources
	Overtime	NA	Overtime
	Staff motivation	NA	Staff motivation

Thus, a revised list for the cost model was proposed, which was subsequently used in the questionnaire to test the proposed model, as can be found in Appendix D8.

5.8.3 E-Procurement Risks

As with all IT solutions, the adoption of e-procurement has associated risks, as is supported by the findings of the case organisations. A comprehensive estimation of the risks of adoption, therefore, should be considered during an *ex-ante* evaluation, in order to prepare the organisation to deal with those risks and to take action to reduce the impacts. This is particularly crucial for determining the speed at which the e-procurement moves from its initial adoption to the final stages of maturity. Through the case studies, 13 types of risk in the adoption of e-procurement were identified and are presented in Table 5.11.

Table 5.11 Findings on E-Procurement Risks

No.	Perceived Risks	Total Responses		Case Organisations				
		(out of 34)	%	1 (out of 3)	2 (out of 13)	3 (out of 14)	4 (out of 5)	5 (out of 2)
1	Internet and network failure	25	73.53	-	7	13	3	2
2	System failure	24	70.59	1	9	9	3	2
3	Lack of e-procurement system knowledge	16	47.06	2	2	9	2	1
4	Security of information and transaction	15	44.12	2	8	2	1	2
5	Human error	11	32.35	1	9	1	-	-
6	System integration risk	10	29.41	-	10	-	-	-
7	Legal aspect	10	29.41	1	1	7	1	-
8	Resistance from internal and external risk	8	23.53	1	-	5	2	-
9	IT readiness risk	7	20.59	-	2	2	3	-
10	Staff turnover risk	5	14.70	1	1	2	1	-
11	Funding risk	3	8.82	1	-	2	-	-
12	Adaptability and interoperability	3	8.82	2	-	-	1	-
13	Organisational risk	2	5.88	1	-	1	-	-

For the purpose of this research, the identified risks have been classified, based on the source of the risks, as either internal or external. Internal risks emerged from the technological, organisational and personnel elements of e-procurement, whereas external risks emerged from the impacts of external partnerships and the surrounding environment. Technology-related risks included the internet, the system itself and network failure, as well as concerns about security and system integration. In addition, there were risks related to human aspects covering staff turnover and human error. Organisational risks were associated with funding uncertainties and changes to structure and culture. From the external point of view, partnership risks emerged from the level of IT readiness and system knowledge, while environmental risks related to the likelihood of resistance from both internal and external organisations. Accordingly, a taxonomy of e-procurement risks was developed from the cross-case findings of the five organisations, which is presented in Table 5.12.

Table 5.12 Taxonomy of E-Procurement Risks

Type	**Perceived Risks**	**Process**	**Organisational knowledge**	**Environmental**	**Partnership**
Internal	Security of information and transaction	√			
	Internet and network failure	√			
	System failure	√			
	Human error	√			
	Staff turnover risk		√		
	Organisational risk		√		
	System integration	√			
	Adaptability and interoperability	√			
	Funding		√		
	Legal aspect		√		
External	IT readiness risk				√
	Resistance to internal and external risk			√	
	Lack of e-procurement system knowledge				√

Minor differences emerged among the findings when compared to the conceptual model. There are two construct items that were not mentioned explicitly in the interviews, relating to risks classification. The first is the risk of running overtime in the procurement schedule, which is actually the impact of technological and human-related risks mentioned previously. Likewise, a risk often lies in the economic condition of the country, and the region in particular. Therefore, it was proposed that only minor adjustments to be made to the conceptual model (Appendix D9).

Table 5.13 Revised E-Procurement Risks Constructs

Classification	Conceptual Model	Case Study Findings	Adjusted Model
Internal	Security and privacy	Security of information and transactions	Security and privacy of transactions and information
	Internet/ network	Internet and network failure	Internet, network and system failure
		System failure	
	Human aspects	Human errors	Human risks
		Staff turnover risks	
	Organisational changes	Organisational risks	Organisational changes
	System integration	System integration risks	System integration
		Adaptability and interoperability	
	Funding	Funding risks	Funding risks
	Legal aspects	Legal aspects	Legal aspects
	Time aspects	NA	Time risks
External	Partnership	IT readiness risks	Partnership
	Environment	Resistance to internal and external risks	Environment
	Public awareness	Lack of e-procurement system knowledge	Public awareness
	Economic	NA	Economic risks

5.8.4 E-Procurement Success Factors

The selected case organisations were among the early e-procurement adopters in Indonesia and they had successfully implemented the system. The degree to which the adoption was successful related to a number of factors. Those factors, therefore, are essential to the successful adoption of e-procurement. The factors which were identified by interviewees from the five case organisations are presented in Table 5.14.

Table 5.14 Success Factors Identified

No.	Perceived Success Factors	Total Responses		Case Organisations				
		(out of 34)	%	1 (out of 3)	2 (out of 13)	3 (out of 14)	4 (out of 5)	5 (out of 2)
1	Human resources development and upgrading	34	100	3	13	14	5	2
2	Commitment and support from stakeholders	25	73.52	3	12	5	3	2
3	Sufficient funding for operations and maintenance	21	61.76	-	7	11	-	1
4	Investment in infrastructure	19	55.88	1	6	10	1	1
5	Organisational culture and structure	17	50.00	1	4	9	1	2
6	Technology and system development	16	47.05	3	5	3	3	2
7	Coordination and communication among stakeholders	14	41.17	2	7	2	2	1
8	Socialisation and public involvement	10	29.41	1	7	1	1	-
9	Regulatory and legal aspects	9	26.47	3	1	1	3	1
10	Support from central government	2	5.88	1	-	-	1	-

Comparisons of the findings revealed that all case organisations noted that human resources were prominent factors. Similarly, other organisational features were commitment from top management, funding support and organisational structure. On the other hand, the technological aspects of e-procurement that were recognised as crucial were investment in IT infrastructure, as well as technology and system development. Technology alone does not guarantee successful adoption: it also depends on surrounding environmental factors. They include intensive communication among stakeholders, public involvement, regulatory compliance and support from central government.

Thus, these organisations' successful practices demonstrated that the success of e-procurement adoption depends upon technological, environmental and organisational factors. Those factors are the same ones underlying the classification of success

factors taxonomy. A taxonomy of e-procurement adoption success factors is presented in Table 5.15.

Table 5.15 Taxonomy of E-Procurement Adoption Success Factors

Classification	Success Factors	Description
Technology	Investment in infrastructure	The degree of adoption can be supported by adequate infrastructure and technology, as well as continuous system development tailored to the needs of the organisation.
	Technology and system development	
Organisation	Human resources development and upgrading	Encouragement in learning the systems can be provided through intensive training for users and vendors.
	Commitment and support from stakeholders	Support and collective commitment from top management is important.
	Sufficient funding for operations and maintenance	Funding for operations and maintenance is critical to organisational adoption performance.
	Organisational culture and structure	Organisational structure and culture transformation positively impacts adoption.
Environment	Coordination and communication among stakeholders	Effective communication and coordination improves awareness and influences behavioural intentions for system use.
	Socialisation and public involvement	Public involvement raises trust and commitment among stakeholders.
	Regulatory and legal aspects	The adoption can be supported with an adequate legal framework governing e-procurement.
	Support from central government	Fundamental support is needed from higher levels of government entities to support further system development.

Further attempts were made to aggregate the findings within the conceptual model. From the taxonomy provided previously, there was minor variability in the success factors related to technology. As the responses were implied through general comments covering all items proposed in the model, no changes were required. Likewise, the analyses for factors that were related to organisation and environment required minor changes to the model. Most of the items were identified and implied by the responses from the case organisations. The adjustment of the conceptual model was employed for further analysis, which is presented in Appendix D10.

Table 5.16 Revised E-Procurement Success Factors Constructs

Classification	Conceptual Model	Case Study Findings	Adjusted Model
Technology	Infrastructure	Investment in infrastructure	Infrastructure
	Technology and system development	Technology and system development	Technology and system development
	System integration		System integration
	Security and authentication		Security and authentication
	Ease of use		Ease of use
Organisation	Structure and culture	Organisational culture and structure	Structure and culture
	Standardised documents and procedures		Standardised documents and procedures
	Resources	Human resources development and upgrading	Organisational resources
	Support from top management	Commitment and support from stakeholders	Support from top management
	Funding support	Sufficient funding for operations and maintenance	Funding support
Environment	Coordination and communication	Coordination and communication among stakeholders	Coordination and communication
	Legal aspects	Regulatory and legal aspects	Legal aspects
		Support from central government	
	Partner and public involvement	Socialisation and public involvement	Partner and public involvement
	Partner awareness	NA	Partner awareness

5.9 Updated Model for Evaluation of Public E-Procurement Adoption

This chapter has provided updates to the conceptual model that was mentioned in Chapter 3. This has been the final outcome of the first stage of data collection through interviews from five different case organisations. The analysis of the constructs for the benefits, costs, risks and success factors involved in e-procurement

adoption have led to a proposition for minor adjustments to the model. This updated model, therefore, will be used in this study hereafter. The details of the updated model can be found in Appendix D11.

5.10 Chapter Summary

The chapter presented the research findings and analyses from five case organisations that had adopted e-procurement in Indonesia. In order to gain insights regarding the current state of e-procurement adoption, a total of 34 interviews were conducted with people from different organisational positions and levels. The findings presented were mainly obtained from interviews, with supporting data from the review of documents from the case organisations. The findings were presented in similar patterns, focusing on the five areas of benefits, costs, risks, success factors and quality of e-procurement adoption within each case organisation.

This study commenced with the development of a conceptual model, which was based on theoretical literatures supporting the research, as mentioned in Chapters 2 and 3 of this thesis. In this chapter, an analysis of the findings has been conducted to test, and to refine, the conceptual model. The analysis was undertaken by identifying trends, patterns or nuances across the five case organisations. The interview findings from the case organisations were compared and amalgamated, resulting in minor adjustments to the conceptual model (Appendix B10). The comparison revealed that the identified constructs from the findings coincided with a majority of the theoretical findings. Accordingly, only minor adjustments were required to update the model. The revised model then could be used to construct the questionnaire and for further testing in the second phase of this study by employing a quantitative approach.

CHAPTER 6

QUANTITATIVE DATA ANALYSIS AND RESULTS

6.1 Introduction

This chapter presents the analysis results of a questionnaire survey that was administered using Survey Monkey. Initially, the preliminary analysis is presented: response rate; descriptive data, including screening, particularly for non-response bias; and the demographics of the respondents. Subsequently, the process of Structural Equation Modelling (SEM) in conjunction with Confirmatory Factor Analysis (CFA) is outlined. The results of goodness-of-fit tests that determine the extent of 'fit' between the model and data are also presented, as well as reliability and validity tests for the measurement model and the developed SEM. The hypotheses are tested and the final hypothesised structural model is evaluated.

6.2 Survey Administration and Response Rate

6.2.1 Survey Administration

Once the questionnaire had been developed using Survey Monkey, the invitations for the online survey were distributed electronically to the targeted respondents' e-mail addresses. The invitation included the link to the Survey Monkey questionnaire for those interested in participating in the research. The targeted respondents were selected from a database provided by the National Procurement Agency (LKPP), taking into consideration their accessibility, appropriateness for inclusion, adequacy and convenience. This resulted in a total of 514 targeted respondents who were purposively selected. Participants were given a 12 week period to complete the survey, with scheduled reminders that were delivered regularly.

6.2.2 Response Rate

In order to maximise the response rate, a number of measures were taken prior to, and during, the deployment of the online survey (Oppenheim, 1992), which included:

- employment of a simple design with a layout that was easy to follow. A brief description of the research was provided and the significance of completing the questionnaire was clearly explained to participants;
- delivery of effective email invitations that were developed specifically to encourage respondents' intentions to participate, including the use the enticing subject line "Support e-procurement in Indonesia by completing our quick survey." A recommendation letter from the LKPP confirming full support and the significance of the research also was provided;
- provision of a directed link to Survey Monkey if participation was chosen. There was also provision to opt out if so desired, ensuring that no further reminders would be received. In addition a brief summary of results was offered to all respondents so that they had the opportunity to review their grouped responses.
- supply of the researcher's contact details for further assistance if any problems were encountered during completion of the questionnaire.

A total of 217 respondents completed the survey, which equates to a 42.30% response rate. There were a total of 296 targets who didn't respond, of which only four respondents decided to opt out from the survey. Nair *et al*, (2005) and Watt et al., (2002) proposed that an adequate response rate for a survey of this nature should be 31% and 33.3%, respectively. Thus, it can be stated that the response rate in this research was considered to be appropriate for further analysis and recording. The summary of the response rate is given in Table 6.1.

Table 6.1 Response Rate of the Online Survey

	Number of Respondents	**Percentage (%) and Reasons**
Invitations sent via e-mail (Survey Monkey)	513	100% (emails delivered to targeted respondents)
Participating respondents	217	42.30%
Usable responses	217	42.30% (all usable)
Non-responses	296	57.70%
Opted out	4	0.78% (respondents decided not to participate)
Total response rate		**42.30%**

6.3 Descriptive Statistics and Data Screening

The survey data from Survey Monkey was transferred to the statistical format of SPSS and was checked for correct labels and readability of values during this process. A descriptive analysis was undertaken for all indicators, the results of which are presented in Appendix E1.

From the descriptive analysis, the constructs of transparency, information technology (IT) penetration, competitiveness and improving public opinion were perceived as the most important benefits of e-procurement adoption, while the resulting reduction in cycle time (of a transaction) ranked lowest among the identified benefits. Further analysis showed that the initial infrastructure investment costs, as well as ongoing server and Internet connection expenses, were the most significant items. Conversely, the costs of managing the transition of partners to the new system, as well as support for organisational changes, were seen to be the least significant costs. In terms of risk, both the security of the system and the vulnerability of the internet connection were the foremost concerns. By contrast, the risks resulting from environmental change, including changes in the way the public are involved, were of the least concern. It also was apparent that the ease of use of the system, as well as its security (particularly through reliable authentication) were the most often cited factors for success, whereas public awareness of the new system was the least cited.

Following the descriptive analysis, data screening was performed to ensure that the data was suitable for further analysis. This included assessment for any missing data,

checking outliers and confirming the normality of data. The data from the questionnaires were reviewed to examine the errors caused by inappropriate responses or incompleteness, leading to invalid data or missing values. The results showed that the data was valid, with no missing values (Appendix E2). The data were also analysed for any outliers, using the standardised z-scores in SPSS. The results showed that none of the variables exceeded the desired value ($z > 4$) with all figures falling between the lowest of -4.46459 (Competitiveness) to the highest of 2.32859 (Public involvement). Thus, all variables were retained for analysis (Appendix E3). In order to confirm the normality of the data, the normal distribution was analysed using the skewness and Kurtosis (< 7) values. The highest value for skewness was 0.203 (public involvement risks), which is still below the threshold value (< 2). For the Kurtosis test, only one result fell below the desired value (< 7) and it was 2.215 (Efficient work flow). Therefore, the data was indicated to have a normal distribution (Appendix E4).

In addition, the analysis for non-response bias was based on a predefined grouping of the two main groups (Appendix E5). A total of eight variables was selected randomly to enable analysis of the non-response bias utilising the independent samples T-Test and the Mann-Whitney U-Test. The results from both tests indicated that there were no differences between the first phase and second phase respondents (Appendices E6 and E7). Hence, it can be stated that the responses of participating respondents adequately reflect the population.

6.4 Demographics Information of the Sample

To obtain a detailed description of the respondents, it is necessary to analyse the demographic data of the respondents. The survey respondents were the officers from many organisations across Indonesia who were responsible for the management and handling of e-procurement on behalf of the public and comprised of a total of 217 respondents. This section discusses the characteristics of the respondents from the perspectives of position, work experience and e-procurement training. All information is presented in actual frequency and percentages to assist with interpretation of the data.

6.4.1 Position

The positions of respondents varied from the head of an institution to all the supporting staff. It is noted from the table that those on tender committees (procurement officers) were the highest in number, accounting for 48.39%, followed by supporting staff and other positions, representing 17.51% and 7.83%, respectively. The results also show that supervisors/heads of units and secretariat staff shared the same percentage of 6.45%, while project officers accounted for 5.99%, work group officers were 5.07%, project receiver committee members corresponded to 1.3% and the least represented group was heads of institutions, covering only 0.92% of respondents.

Table 6.2 Survey Respondents by Position

Position	Frequency	Percentage (%)
Tender committee member	105	48.39
Supporting staff	38	17.51
Others	17	7.83
Supervisor/head of unit	14	6.45
Secretariat staff	14	6.45
Project officer (PPK)	13	5.99
Work group/team group member	11	5.07
Project result receiver committee member	3	1.38
Head of institution	2	0.93
Total	**217**	**100**

6.4.2 Work Experience

The work experiences attained by the survey participants are presented in Table 6.3. The findings show that a majority of respondents had been working for more than 2 years. The category of 2-5 years of experience was the foremost outcome, accounting for 57.14%, followed by the categories of 1-2 years and 5-10 years at 22.58% and 16.13%, respectively. The least representative categories were ≤ 1 year (2.76%) and more than 10 years of experience (1.84%).

Table 6.3 Survey Respondents by Years of Work Experience

Years in current position/Experience	Frequency	Percentage (%)
≤ 1 year	6	2.76
1 - 2 years	49	22.58
2 - 5 years	124	57.14
5 - 10 years	35	16.13
≥ 10 years	4	1.84
Total	**217**	**100**

6.4.3 E-Procurement Training

It was also important to have a brief outline of the type of training undertaken and workshop attendance by those respondents in relation to their functions pertaining to e-procurement. There were eight types of training identified, as shown in Table 6.4. It is noted that 77.88% of respondents had gained the certificate for public procurement and more than half of the respondents had participated in the e-procurement software application training (67.74%). Respondents also had attended other training courses, such as IT for e-procurement (26.27%), e-procurement Training for Trainers (15.67%), legal aspects (15.67%), project management (10.6%) and other types of training (4.61%).

Table 6.4 Survey Respondents by Training/Workshop Attended

Training/Workshop	Frequency	Comparative Percentage (%)
National procurement certification	169	77.88
SPSE application for e-procurement	147	67.74
IT for e-procurement	57	26.27
Training of trainers for procurement	34	15.67
Procurement legal aspects	34	15.67
Elementary procurement course	28	12.90
Project management	23	10.60
Others	10	4.61

6.5 Structural Equation Modelling (SEM)

This section presents the results of the two stages of the SEM approach. The analysis begins with CFA of the measurement model for the variables of benefits, costs, risks, success factors and quality. The assessment of the validity and reliability of each

construct also is provided. CFA is subsequently performed on the structural model. As with the measurement model, the check for validity and reliability is performed. Finally, the structural model is developed to test the hypotheses.

6.5.1 Measurement Model of Benefits

The measurement model for the 'Benefits' constructs consist of strategic benefits (BEST), operational benefits (BEOP) and tactical benefits (BETA). The measurement model of 'Strategic Benefits' consists of five observed variables. Goodness-of-fit measures, as well as validity and reliability thresholds, were checked to verify the strategic benefits variables in the measurement model. The results show that the model fit was less than adequate. Although the indices for GFI, AGFI, CFI, NFI and TLI were relatively high (Appendix E8) and above the benchmark levels, the RMSEA value, however, suggested that there may be problems because the value was 0.107 (above the desired value of 0.08). This indicates a poor GFI. Therefore, the model required modification to fit the data.

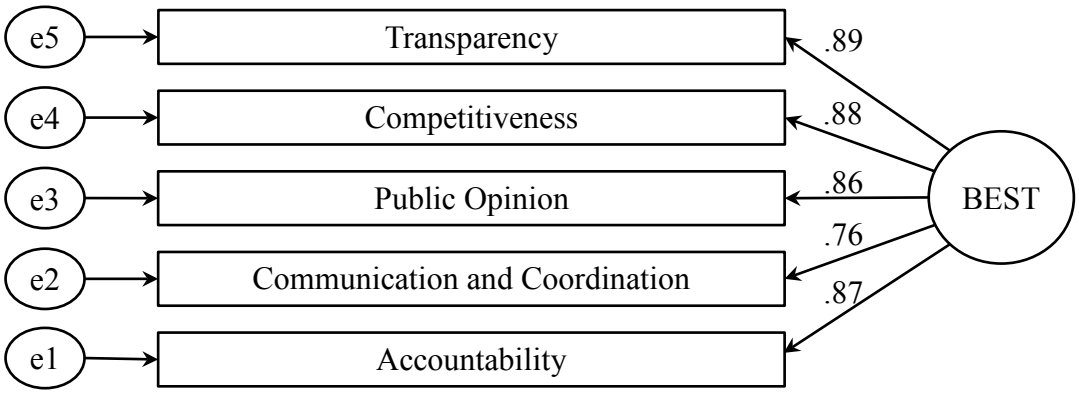

Figure 6.1 Measurement Model of 'Strategic Benefits'

An analysis of the potential sources of poor model fit revealed significant values in Modification Index (MI) for four items. The error variances of BESTA and BESTD were correlated, as well as for BESTB and BESTC. The re-specified model was then tested in AMOS. This modification generated a model fit. All indices (GFI, AGFI, CFI, NFI and TLI) were close to the value of 1, which suggests a near perfect model fit. An RMSEA (0.035) score below the benchmark of 0.08 confirmed this model fit

(Appendix D8).

The measurement model of 'Operational Benefits' has six observed variables, as shown in Figure 6.2. The initial model was tested for model fit. The GFI values showed good fit, but the RMSEA value of 0.097 is just above the cut-off point of 0.08 (Appendix E9), which indicates the requirement of modification for better model fit.

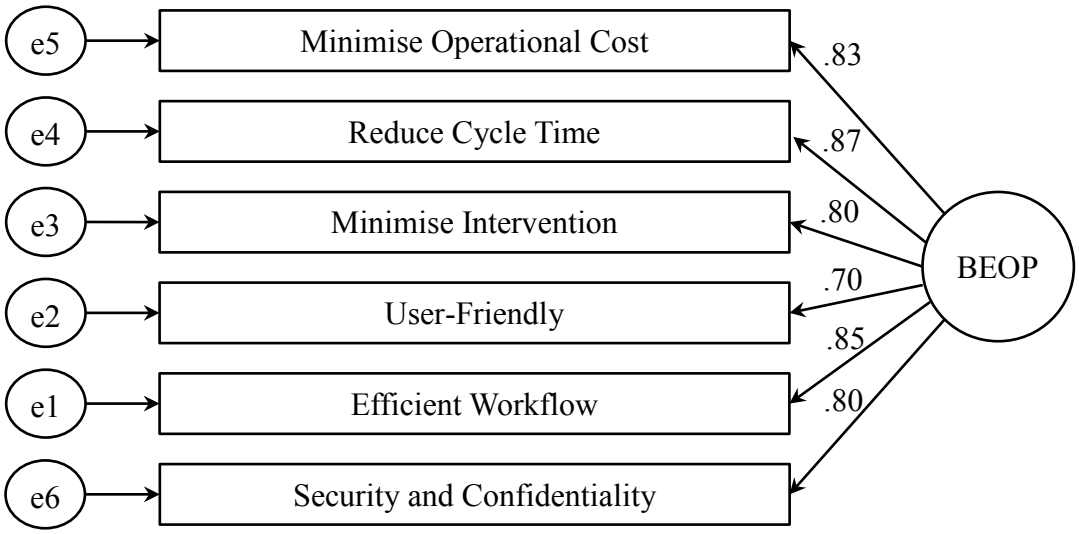

Figure 6.2 Measurement Model of 'Operational Benefits'

The analysis of the modification indices indicated that there were significant MI values for six items. It was suggested to correlate BEOPB and BEOPD, BEOPC and BEOPE, and BEOPD and BEOPF. The re-specified model was rerun and the results indicated a model fit. Overall indices of model fit then met the required threshold (Appendix E9).

The measurement model of 'Tactical Benefits' was measured using the five tactical benefit items (Figure 6.3). The model was examined and the results indicated an unsatisfactory model fit. The initial comparative fit indices of AGFI and RMSEA indicated an unacceptable data-model fit (Appendix E10) and therefore it was subjected to modification.

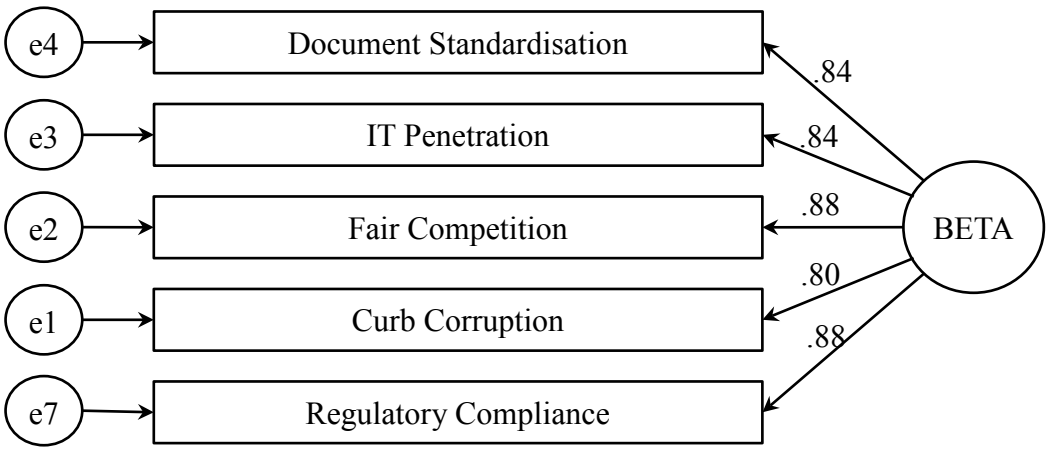

Figure 6.3 Measurement Model of 'Tactical Benefits'

An investigation into the reasons for poor model fit identified that potential re-specification came from the error covariance parameters of BETAB, BETAC, BETAD and BETAF. Considering the MI values, modifications were made by covarying the error variances of BETAB and BETAD, BETAB and BETAE, and BETAC and BETAD. The modified model was retested and yielded a satisfactory model fit (Appendix E10).

Following that the first-order CFA of benefits was undertaken. The measurement model for 'Benefits' was represented using three factors, which were Strategic Benefits (BEST), Operational Benefits (BEOP) and Tactical Benefits (BETA). This is presented schematically in Figure 6.4. A first-order CFA for 'Benefits' was run for the benefits measurement model . The results show that the model fit did not meet the requirements of the specified goodness-of-fit criteria (Appendix E11). The RMSEA was 0.093 (above the desired value of 0.08) and both the GFI and AGFI values were below the cut-off point of 0.9 (0.853 and 0.801, respectively). This, therefore, indicates an unacceptable GFI and requires model modification.

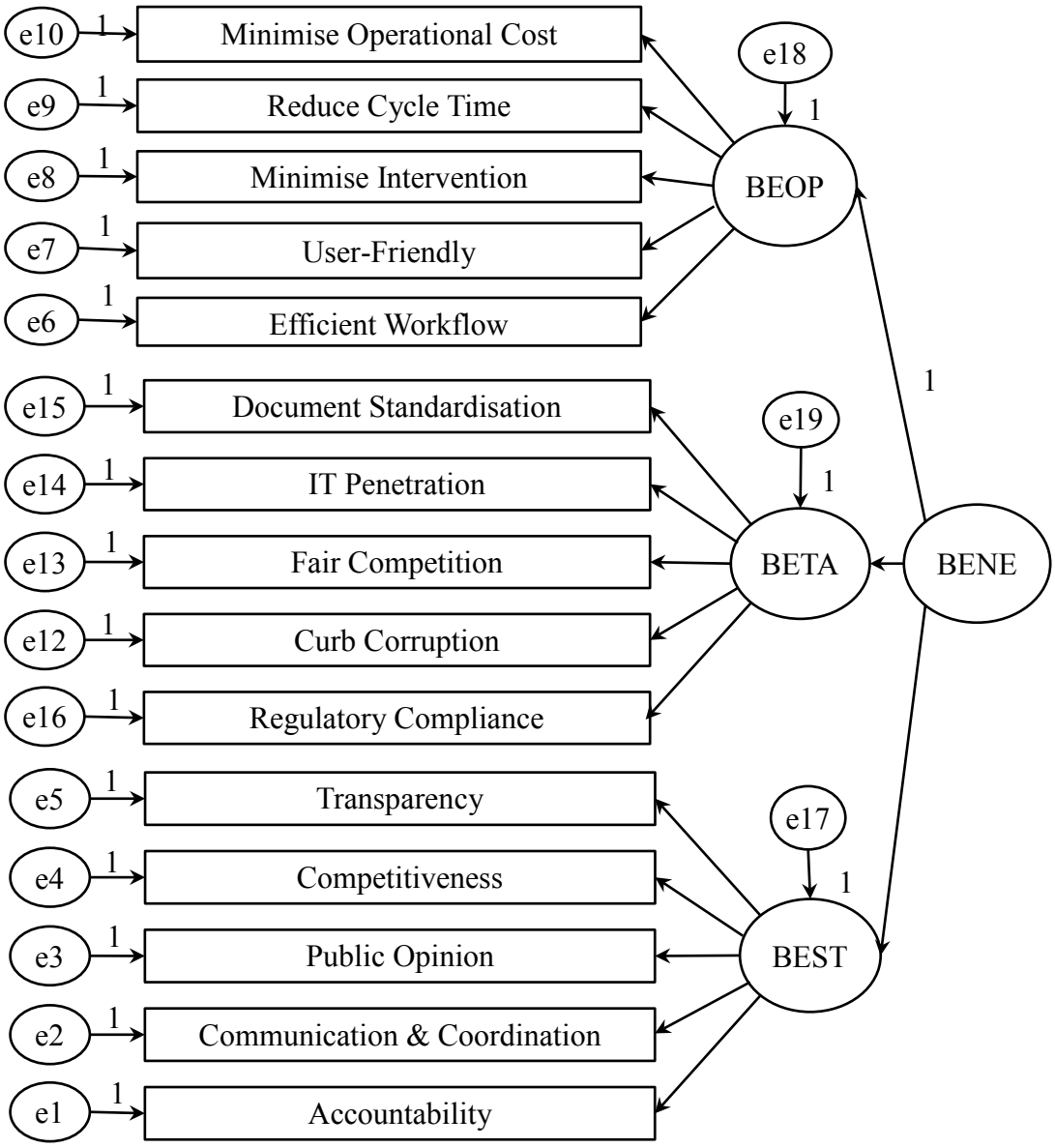

Figure 6.4 First-Order CFA of 'Benefits'

From the results of the initial model, possible re-specification candidates, identified by their extremely low standardised factor loadings, were the constructs of BEOPA (Minimise operational costs), BEOPD (User-friendly), BESTD (Communication and coordination), BETAB (IT penetration) and BETAD (Curb corruption). The decision was made to delete items iteratively. The remaining constructs were retested with CFA and yielded better model fit (Appendix E11). This model was then tested in the second-order CFA for further analysis. The second-order CFA for 'Benefits' was developed from the first-order CFA results. The model was rerun and the results indicated the need for modification.

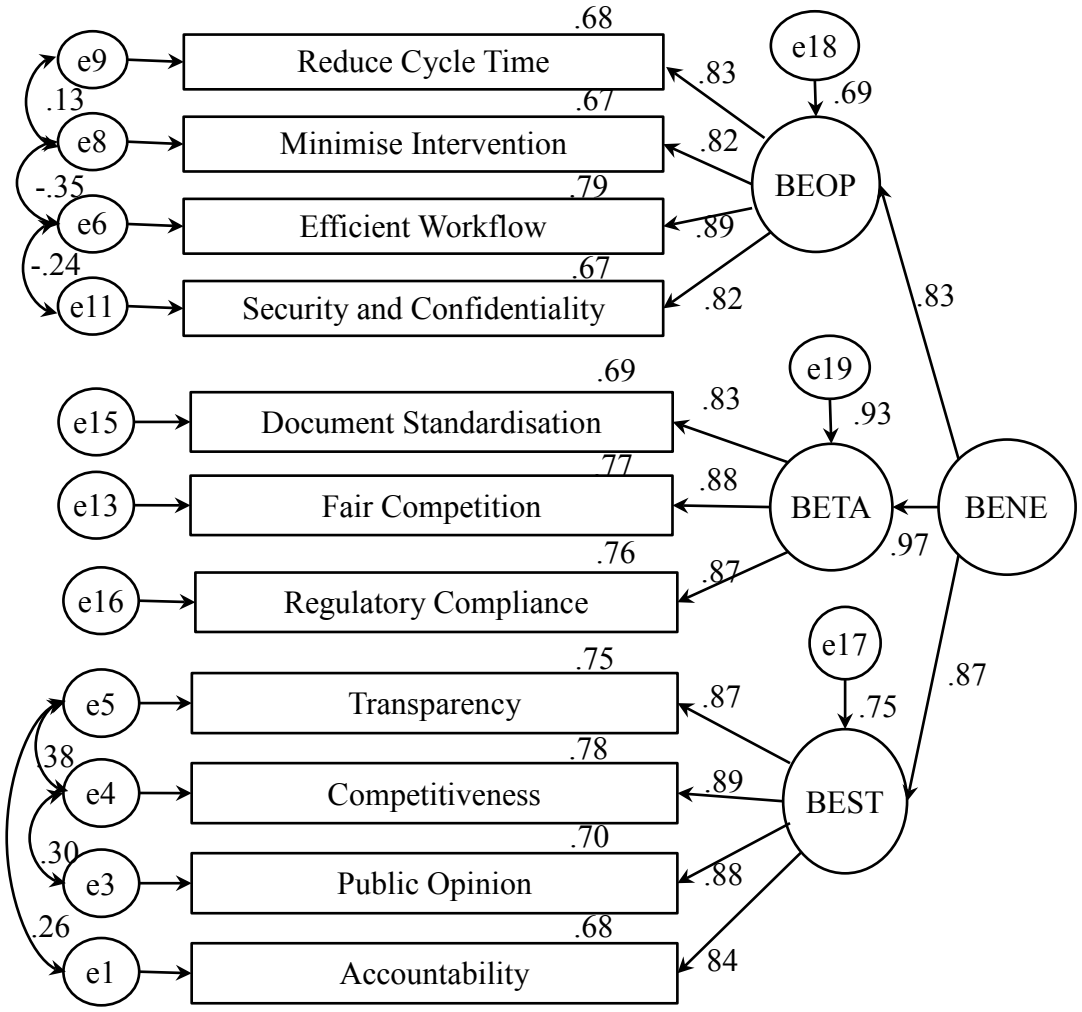

Figure 6.5 Second-Order CFA of 'Benefits'

Detailed examination of the model revealed significant values in the MI values of six items. Accordingly, the modification was made by correlating: BESTA and BESTB; BESTA and BESTD; BESTB and BESTC; BEOPB and BEOPC; BEOPC and BEOPE; and BEOPE and BEOPF. The second-order CFA was rerun resulting in good fit. Thus, it is assumed that the final measurement model of 'Benefits' met the goodness-of-fit and uni-dimensionality assessments. Thereafter, the model was tested for validity and reliability.

Table 6.5 GFI for Second-Order CFA of 'Benefits'

	Estimate	**Goodness-of-Fit Indices**
BESTE <--- Strategic Benefits	0.837	X^2 = 60.634; P = 0.005; CMIN/DF = 1.732; GFI = 0.952; AGFI = 0.910; CFI = 0.987; NFI = 0.970; TLI = 0.980 ; RMSEA= 0.058; Standardised RMR = 0.0248 Deleted items : BEOPA BEOPD BESTD BETAB BETAD
BESTC <--- Strategic Benefits	0.876	
BESTB <--- Strategic Benefits	0.886	
BESTA <--- Strategic Benefits	0.867	
BEOPE <--- Operational Benefits	0.887	
BEOPC <--- Operational Benefits	0.818	
BEOPB <--- Operational Benefits	0.827	
BEOPF <--- Operational Benefits	0.819	
BETAC <--- Tactical Benefits	0.875	
BETAA <--- Tactical Benefits	0.832	
BETAE <--- Tactical Benefits	0.870	

Reliability for the 'Benefits' construct was assessed using Cronbach's alpha, Construct Reliability (CR) and Average Variance Extracted (AVE) methods. Table 6.6 summarises the results of the measurement model for 'Benefits' validity.

Table 6.6 Reliability Results for Measurement Model of 'Benefits'

Reflective construct	**Items/ Indicates**	**Standardised Loading**	**Construct Reliability (CR)**	**Average Variance Extracted (AVE)**	**Cronbach's Alpha**
BEST	BESTE	0.837	0.923	0.901	0.929
	BESTC	0.876			
	BESTB	0.886			
	BESTA	0.867			
BEOP	BEOPE	0.887	0.904	0.794	0.894
	BEOPC	0.818			
	BEOPB	0.827			
	BEOPF	0.819			
BETA	BETAC	0.875	0.894	0.862	0.894
	BETAA	0.832			
	BETAE	0.870			

As can be seen from the table, CR values for all constructs are above the cut-off point of 0.60. Similarly, all constructs listed in the table indicate acceptable AVE values above the allowed minimum of 0.5. Likewise, the values of Cronbach's alpha satisfied the minimum requirement of 0.70. Thus, the reliability of constructs within

the benefit measurement model was verified and satisfied. In regard to validity measurement, the results from CFA of the measurement model 'Benefits' indicated good model fit. As reliability was confirmed, convergent validity also was verified. Therefore, the model for benefits was considered to be suitable for the next stage, using the structural model.

6.5.2 Measurement Model of Costs

The measurement model of Costs was developed from two constructs of Indirect Costs (COIN) and Direct Costs (CODI). The initial measurement model of 'Indirect Costs' consisted of six items. The model was examined using CFA and the results exhibited a poor model fit, since fit indices were below the recommended levels. Although the indices of CFI and NFI were above the desired value of 0.90, the remaining index values (GFI, AGFI and TLI) were below the threshold of 0.90. Likewise, the RMSEA indicated poor fit, being far from the expected value of 0.08 (Appendix E12). Therefore, model modification required further examination.

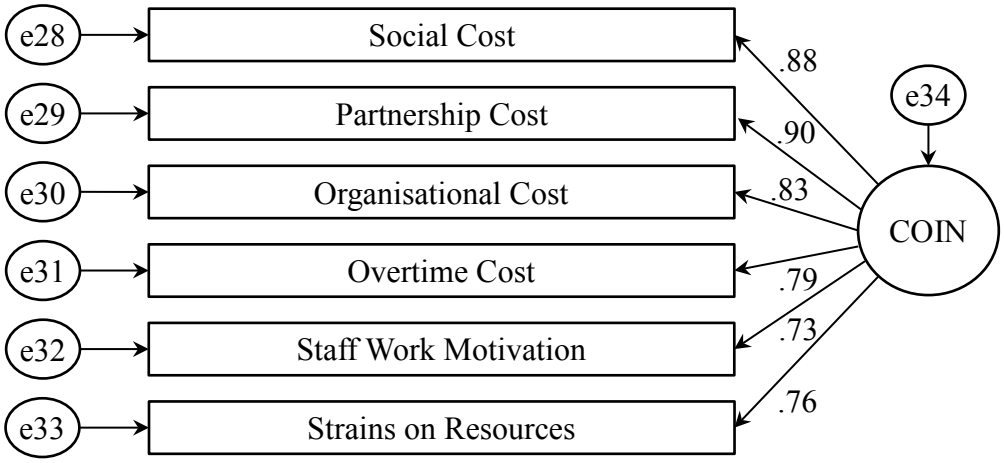

Figure 6.6 Measurement Model of 'Indirect Costs'

Examination of the error covariance in MIs suggested at least two modifications were necessary. In order to obtain a better structural model fit, error covariance parameters for COINA (Social cost) and COINB (Partnership cost), as well as COINC (Organisation cost) and COIND (Overtime cost), were correlated and added incrementally into the modified model, which was retested using CFA and resulted in

a satisfactory level of model fit (Appendix E12). Therefore, it was assumed to satisfy the uni-dimensionality assessment.

Following that, the measurement model for 'Direct Costs' was operationalised and developed, based on eight constructs. The initial model was examined in CFA and demonstrated a poor model fit (Appendix E13). The initial measurement model test showed an unsatisfactory data-model fit, with the initial comparative fit indices being below the required level of good model fit. Therefore, model modification was required.

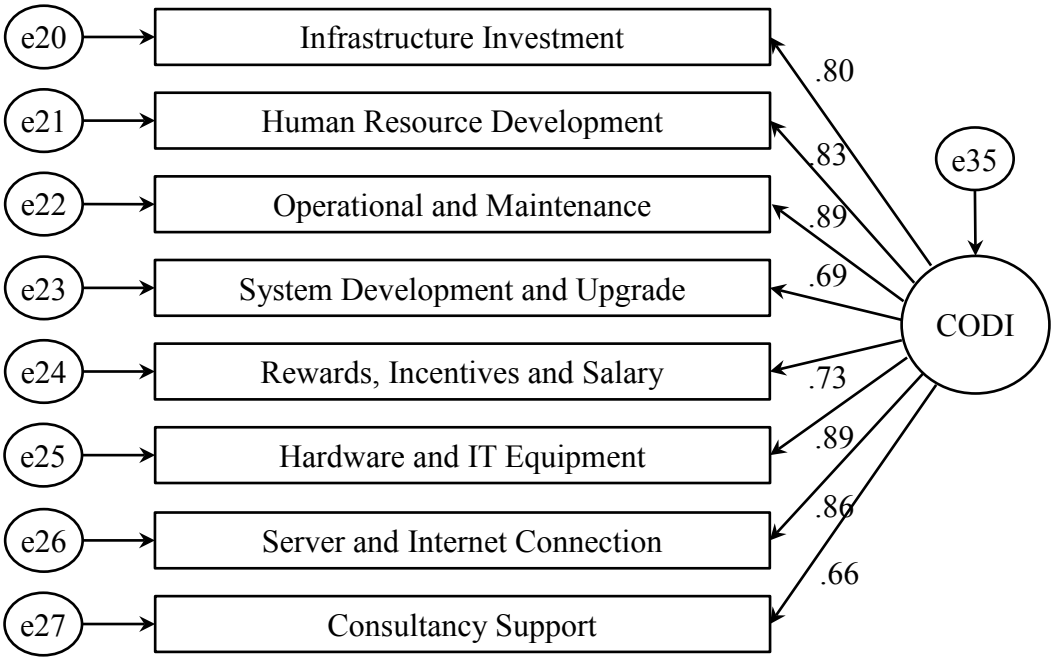

Figure 6.7 Measurement Model of 'Direct Costs'

Analysis of the possible causes of the unsatisfactory fit of the model suggested correlation of eight pairs of error terms, based on the significant changes in the MI values. These were CODIA (Infrastructure investment) and CODIF (Hardware equipment), CODIB (Human resources) and CODIC (Operational and maintenance), CODIB (Human resources) and CODIG (Server), CODIB (Human resources) and CODIE (Rewards and incentives), CODID (System development) and CODIE (Rewards and incentives), CODID (System development) and CODIH (Consultancy), CODIE (Rewards and incentives) and CODIH (Consultancy), as well

as CODIF (Hardware equipment) and CODIG (Server). The modification process produced a more robust measurement model (Appendix E13). Accordingly, the modified model was retested using CFA and the results showed a significant improvement from the initial model, as indicated by good model fit.

The model was then tested using CFA for first-order model of 'Costs', which consisted of Indirect Costs (COIN) and Direct Costs (COIN) constructs, as presented in Figure 6.8. A first order CFA of 'Costs' was examined and the results indicated that the model was not favourable for good model fit because the fit indices were below the required values. Therefore, the model needed to be amended (Appendix E14).

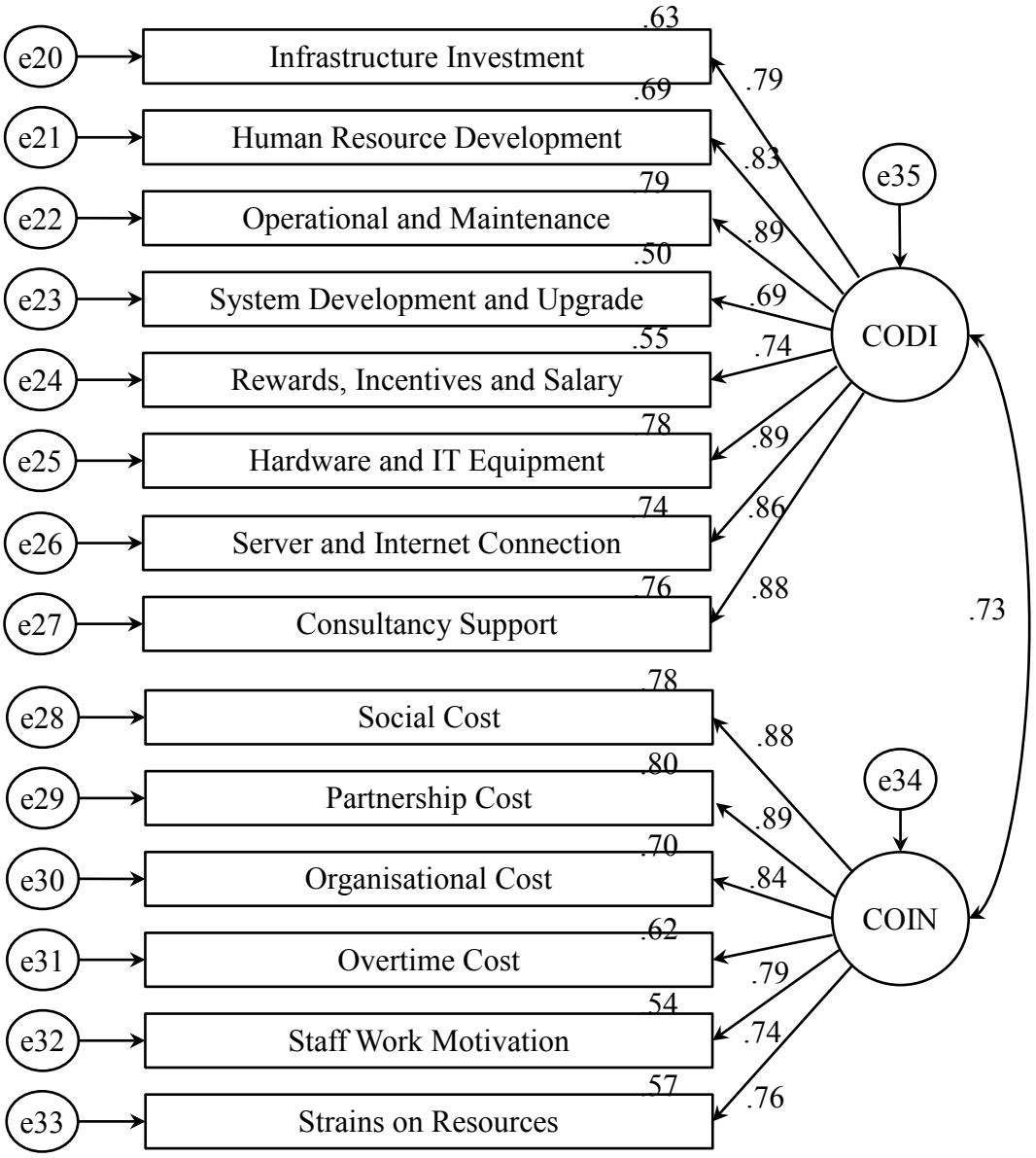

Figure 6.8 First-Order CFA Measurement Model for 'Costs'

From the results of the first-order model, potential sources for modification came from the low factor loadings of CODIB (Human resource development), CODIC (Operational and maintenance), CODID (System development), CODIE (Rewards and incentives), CODIH (Consultancy), COIND (Overtime costs), COINE (Staff motivation), and COINF (Strains on resources). Thus, the decision was made to iteratively drop each of these items to check their significance. The results showed that more than half of the cost items could be removed, without significantly impacting on the model's applicability. That is, these factors were shown to not be

significantly contributing to the cost of e-procurement adoption.

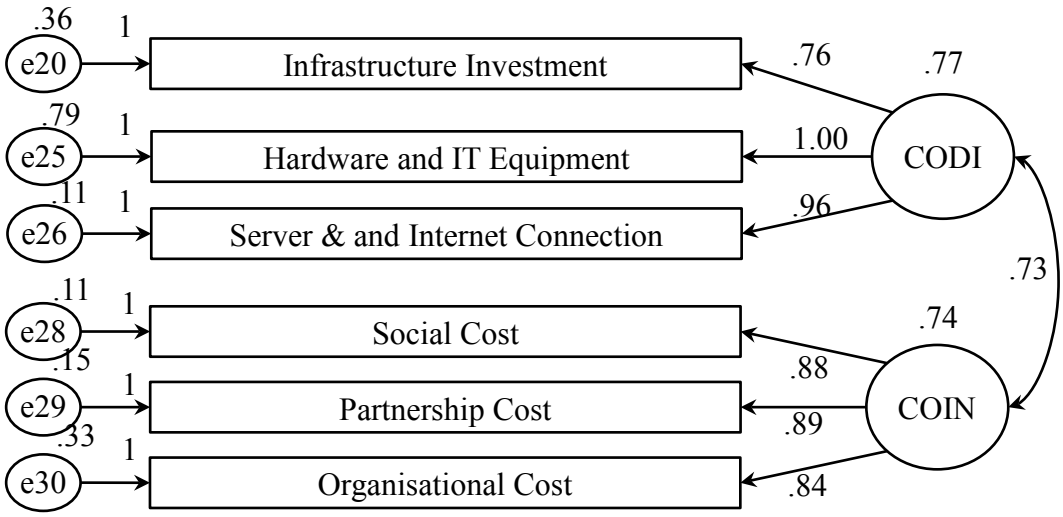

Figure 6.9 First-Order CFA of Modified Model for 'Costs'

The result of modification indicated an improvement to the overall model fit (Appendix E14), with fit indices showing values above the threshold of 0.9. However, the RMSEA value (0.084) was slightly above the desired level of 0.08. MacCallum *et al.* (1996) described RMSEA values of between 0.08 and 0.10 as providing a mediocre fit. In addition, taking into consideration the consistency of the model fit as inferred from" the previous multiple fit categories, which all indicated good fit, this RMSEA value may be considered as acceptable. The next step commenced with CFA for the second-order CFA of costs, that was developed from the first-order model. It consisted of two first-order variables and six causal indicators, as presented in Figure 6.10.

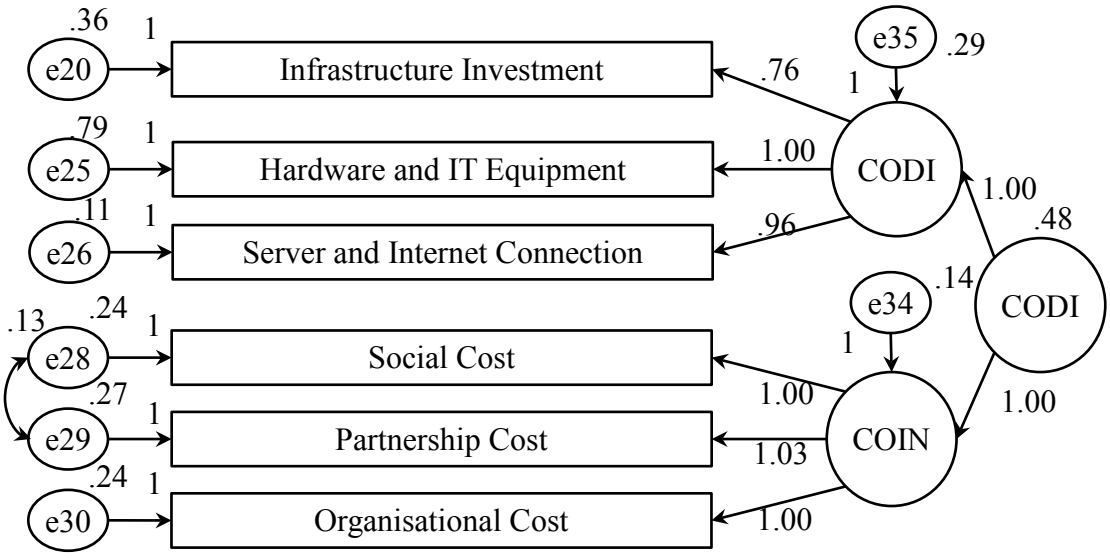

Figure 6.10 Second-Order CFA of Modified Model for 'Costs'

The second-order measurement model was examined and it confirmed that the model needed to be modified because the RMSE value was unsatisfactory. It was identified that only one error covariance parameter would need to be added into the measurement model for model modification. The error term of COIN(A) (Social cost) was correlated with COIN(B) (Partnership cost), and the re-specified model was rerun, resulting in better fit indices. The modification produced an improvement that resulted in adequacy of the model fit and met the requirements of the uni-dimensionality measures. Thus, the final measurement model for costs was retained for analysis of the structural model in the second stage.

Table 6.7 GFIs for Second-Order CFA of the Re-specified Model for 'Costs'

	Estimate	**Goodness-of-Fit Indices**
CODIF<--- Direct Costs	0.949	X^2 = 13.300; P = 0.065; CMIN/DF = 1.900; GFI = 0.980; AGFI = 0.940; CFI = 0.994; NFI = 0.988; TLI = 0.987; RMSEA= 0.065; Standardised RMR = 0.0251
CODIA<--- Direct Costs	0.743	
CODIG<--- Direct Costs	0.929	
COINC<--- Indirect Costs	0.849	
COINB<--- Indirect Costs	0.841	
COINA<--- Indirect Costs	0.851	

In order to ensure the model validity and reliability, the individual item underlying each construct of the measurement model for 'Costs' were assessed. Table 6.8 shows the reliability of each construct and its related items. The CR and AVE for all constructs satisfied the benchmark values. Likewise, Cronbach's alphas were above the benchmark of 0.70, indicating that reliability was verified and satisfied.

Table 6.8 Reliability Results for Measurement Model of 'Costs'

Reflective Construct	**Items/ Indicators**	**Standardised Loading**	**Construct Reliability (CR)**	**Average Variance Extracted (AVE)**	**Cronbach's Alpha**
CODI	CODIF	0.949	0.909	0.887	0.904
	CODIA	0.743			
	CODIG	0.929			
COIN	COINC	0.849	0.884	0.845	0.907
	COINB	0.841			
	COINA	0.851			

The validity of the measurement model was examined for construct validity and convergent validity. In regard to construct validity, the measurement model for costs provided a good model fit. Likewise, convergent validity for all constructs was above the threshold (Factor loadings > 0.50), and the AVEs and CRs were acceptable. Thus, the validity of all constructs in this section was verified and satisfied.

6.5.3 Measurement Model of Risks

The measurement model for 'Risks' was developed from the two constructs of 'Internal Risks' (RISI) and 'External Risks' (RISE). The measurement model for internal risks was operationalised using eight items. The model was examined using CFA to test for model fit and uni-dimensionality. The results demonstrated a poor model fit and, therefore, some modifications were required to better fit the data (Appendix E15).

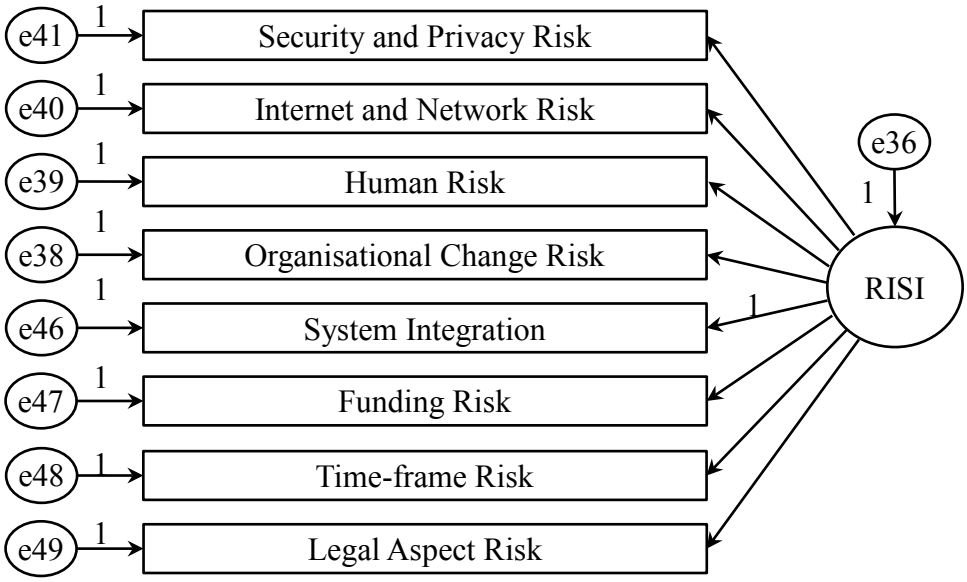

Figure 6.11 Measurement Model of 'Internal Risks'

The possible modification of the model issued from the error covariance parameter of RISIB (Internet and network) and RISIC (Human), so the decision was made to add the correlation path to the model. Following the same process, ten more error covariance parameters were added into the model incrementally. In total, there were eleven additional correlation paths in the modified model to be retested. The results of modification demonstrated significant improvement in the multiple indices of fit. In summary, the modified measurement model for internal risks satisfied the uni-dimensionality measures (Appendix E15).

The measurement model of 'External Risks' was developed from four observed variables and was tested via CFA. The output indicated that the GFI, CFI and NFI values satisfied the recommended levels. However, AGFI, TLI and RMSEA demonstrated inadequate values. Further examination was undertaken to modify the model (Appendix E16). The review of the results indicated two possible modifications based on the significant MI values of RISEB (Environment) to RISED (Awareness), and RISEC (Involvement) to RISED (Awareness). Accordingly, the modification allowed the error terms to correlate and they were retested using CFA. The modification resulted in a model that fit the data well.

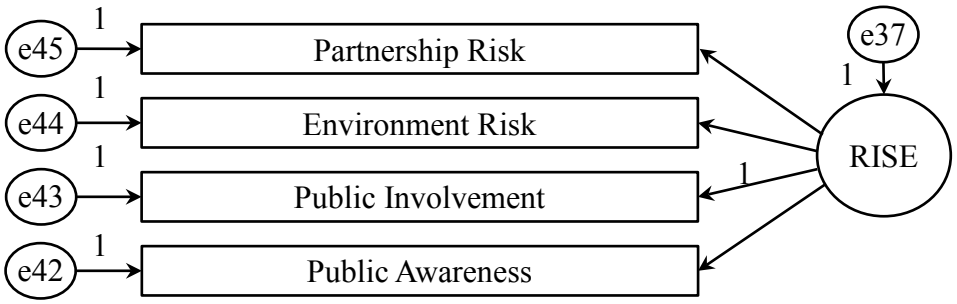

Figure 6.12 Measurement Model of 'External Risks'

The next step was undertaken with a first-order CFA for the measurement model 'Risks' was developed from two constructs: Internal Risks (RISI) and External Risks (RISE). A first-order CFA was examined and it demonstrated inappropriate model fit (Appendix E17). Accordingly, modifications were made to fit the model to the data. The examination of the possible revision required suggested removing the constructs of RISIA (Security and privacy), RISIB (Internet), RISIC (Human) and RISEB (Environment), based on the standardised residual covariance and modification indices. The remaining nine items were re-examined and this indicated great improvement in the overall fit indices. Despite the removal of four items from the model, the modified model indicated good model fit (Appendix E17).

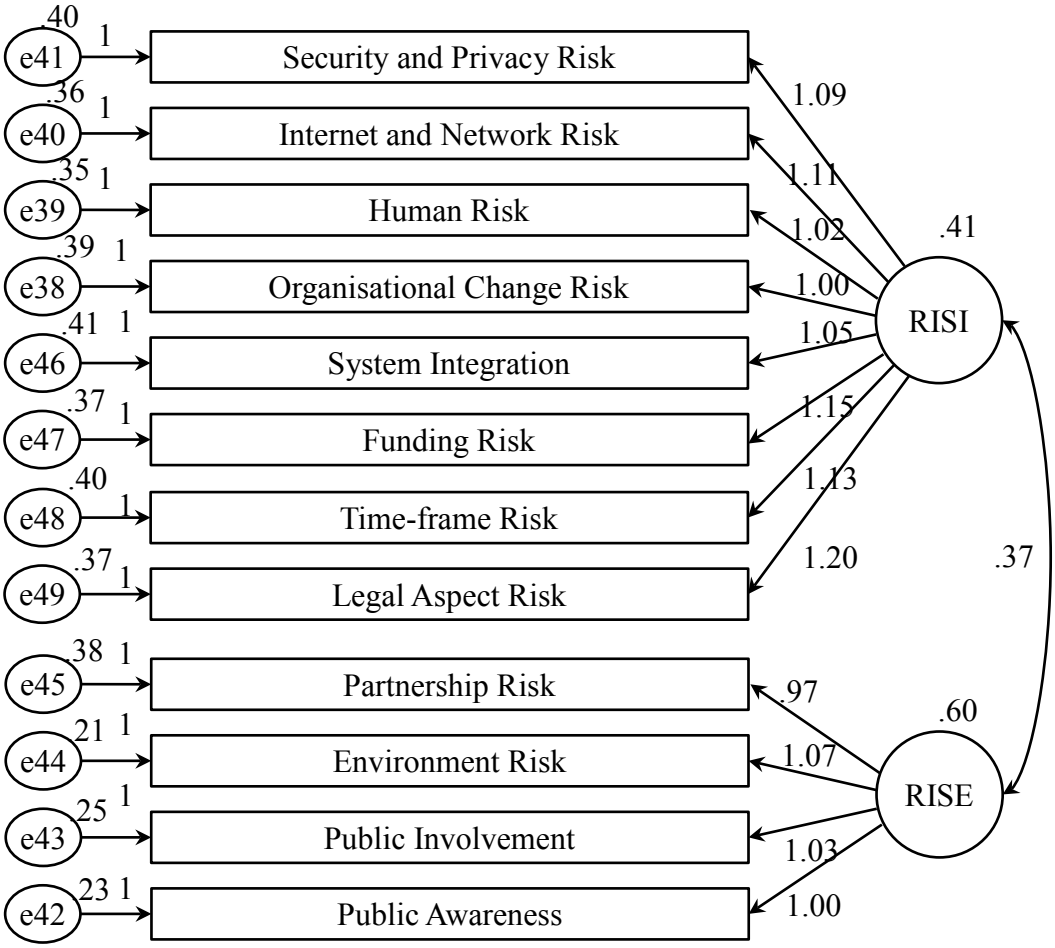

Figure 6.13 First-Order CFA of Measurement Model for 'Risks'

The first-order CFA results were used to develop the second-order CFA of 'Risks'. The model was examined and the results indicated that model modification was required.

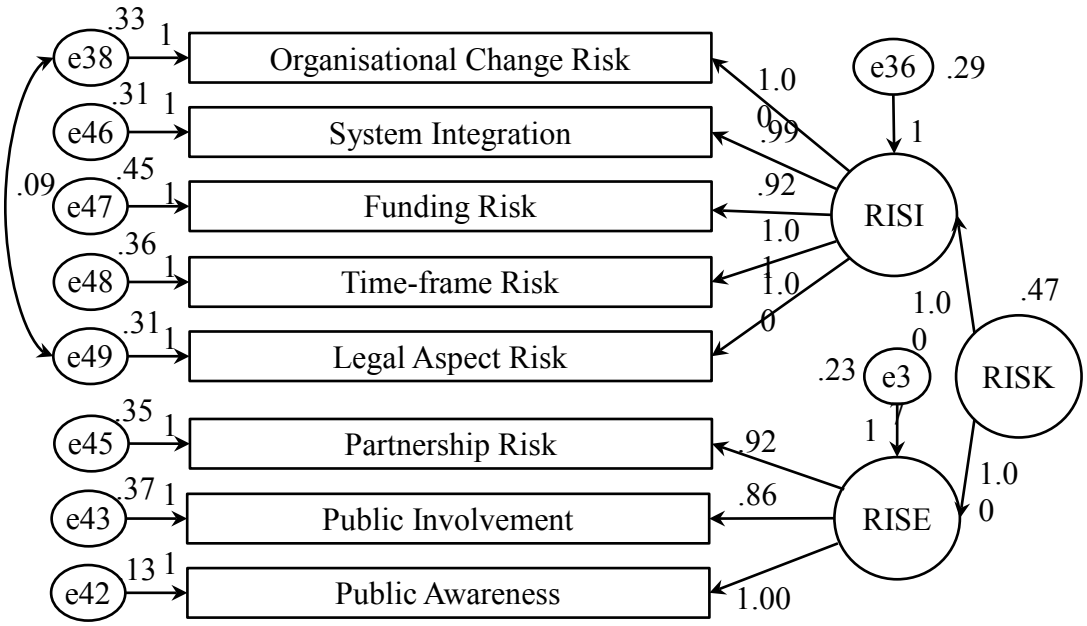

Figure 6.14 Second-Order CFA of Measurement Model for 'Risks'

The analysis of the MIs for factor loadings indicated that the parameters for RISID (Organisational changes) represented cross-loading to RISIH (Legal aspect) and they were allowed to correlate. The modified model was re-examined and satisfied the goodness-of-fit and uni-dimensionality requirements.

Table 6.9 GFIs for Second-Order CFA of 'Risks'

	Estimate	**Goodness-of-Fit Indices**
RISID <--- Internal Risk	0.794	X^2 = 33.773; P = 0.020; CMIN/DF = 1.778; GFI = 0.962; AGFI = 0.928; CFI = 0.985; NFI = 0.967; TLI = 0.978; RMSEA = 0.060; Standardised RMR = 0.0334
RISIE<--- Internal Risk	0.801	
RISIF<--- Internal Risk	0.715	
RISIG <--- Internal Risk	0.783	
RISIH <--- Internal Risk	0.802	
RISED <--- External Risk	0.919	
RISEC <--- External Risk	0.763	
RISEA <--- External Risk	0.793	

The model was further tested for its reliability and validity. The reliability of the measurement model risks was examined using Cronbach's alpha, Construct Reliability (CR) and Average Variance Extracted (AVE) of RISE (External Risk) and RISI (Internal Risk) constructs. The results demonstrated that the CR and AVE values satisfied the requirements of reliability assessment. In addition, the validity of

the measurement model was examined for its construct validity and convergent validity. Taking into consideration the CFA results for the final measurement model, the multiple fit indices indicated good validity of all the constructs. Further, the review of factor loadings demonstrated satisfactory values (> 5.0). In summary, the validity of all constructs in this section was verified and satisfied.

Table 6.10 Reliability Results for Measurement Model of 'Risks'

Reflective construct	Items/ Indicates	Standardised Loading	Construct Reliability (CR)	Average Variance Extracted (AVE)	Cronbach's Alpha
RISI	RISID	0.794	0.886	0.825	0.887
	RISIE	0.801			
	RISIF	0.715			
	RISIG	0.783			
	RISIH	0.802			
RISE	RISED	0.919	0.866	0.817	0.860
	RISEC	0.763			
	RISEA	0.793			

6.5.4 Measurement Model of Success Factors

This section discusses the development of the measurement model for 'Success Factors' that were operationalised by the three sub-dimensions (first-order) of 'Technological Factors' (SFTE), 'Organisational Factors' (SFTO) and 'Environmental Factors' (SFEN). The second-order model of 'Success Factors' was generated from three constructs of the first-order measurement model. The measurement model of 'Technological Factors' consists of five items, as shown in Figure 6.15. The model was examined and the results indicated a poor fit across all goodness-of-fit measures. For this reason, further modification was conducted and measures of fit were reapplied.

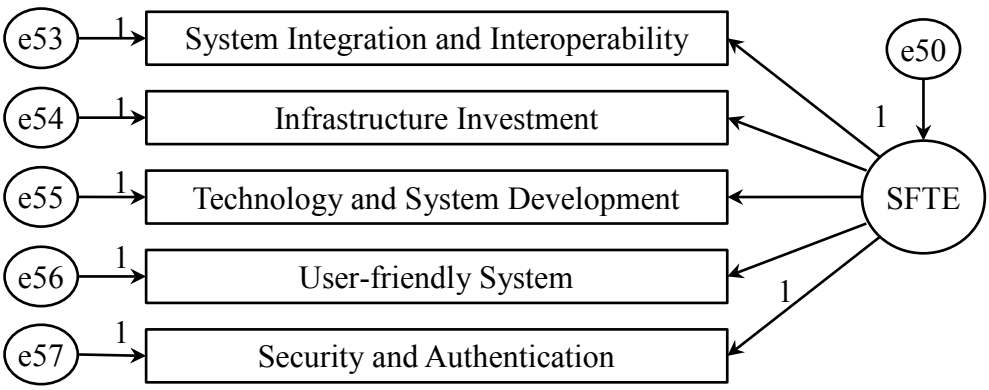

Figure 6.15 Measurement Model of Technological Factors

The analysis of MIs for regression weights revealed that three error covariance parameters should be correlated to improve model fitness. Since the correlation of three error parameters clearly made theoretical sense, modification was made by allowing SFTEB (Infrastructure) and SFTEC (System development), SFTEB (Infrastructure) and SFTED (User-friendliness), as well as SFTEB (Infrastructure) and SFTEE (Security) to correlate. The modified model, with three added paths, was retested and yielded significant improvement to model fit (Appendix E18).

The measurement model of 'Organisational Factors' encompassed six items (Figure 6.16). The model was examined utilising CFA and the results indicated an inadequate model fit. Therefore, modification was required to improve model fit (Appendix E19).

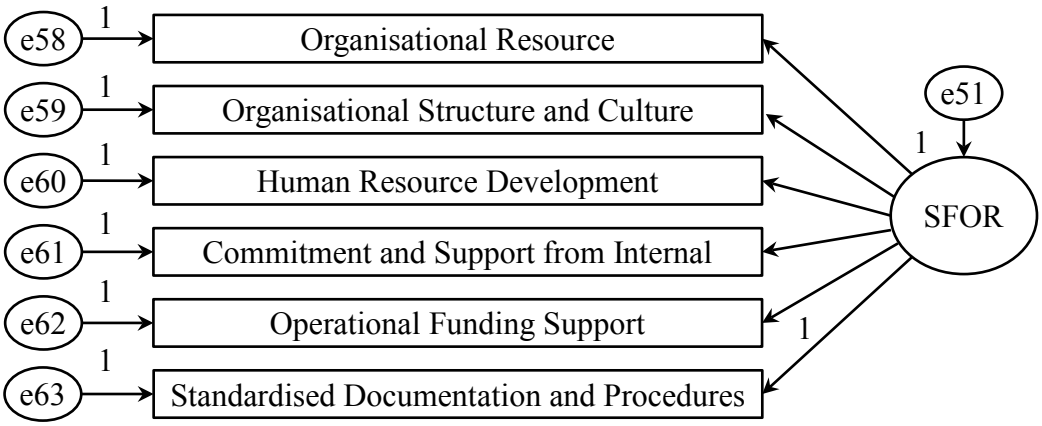

Figure 6.16 Measurement Model of 'Organisational Factors'

The investigation of the MI values identified significant change in five items: SFORB (Structure), SFORC (Human resources), SFORD (Commitment), SFORE (Operational funding) and SCOREF (Standardised documentation). These items were, therefore, correlated iteratively and CFA was rerun with the additional five correlation paths. The results showed an acceptable overall model fit with the data (Appendix E19).

The measurement model of 'Environmental Factors' was measured by four items. A CFA was first run for the initial model, but the output indicated poor fit to the data. The decision was made to modify the model (Appendix E20).

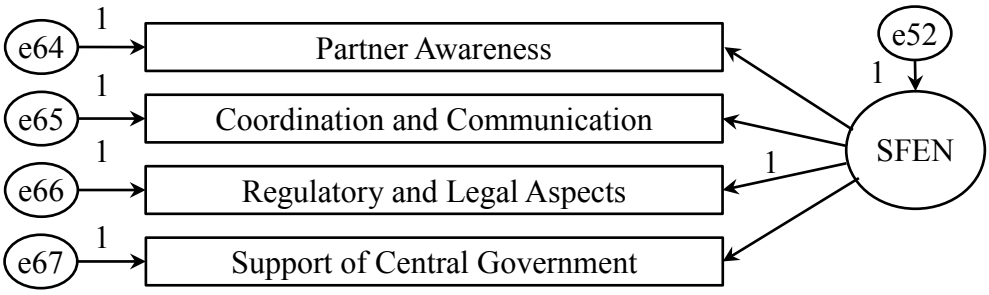

Figure 6.17 Measurement Model of 'Environmental Factors'

The review of the MI index suggested that re-specification was necessary due to the error terms of SFENB (Coordination) and SFEND (Central government). Accordingly, both items were correlated, with one new path incorporated into the model for further CFA. The results showed slight improvements in the fit indices of GFI, CFI, NFI and TLI. Nevertheless, the AGFI and RMSEA still indicated unacceptable results. Different alternatives were tried, by allowing new correlation paths between constructs or by removing paths; however, there was no improvement in the model fit indices, confirming the original model as the best that could be achieved. The results indicated poor fit (Appendix E20) and were rejected for further analysis.

First-order CFA of the measurement model for 'Success Factors' was aggregated from multi-items of formative measures including 'Technological Factors' (SFTE), 'Organisational Factors' (SFTO) and 'Environmental Factors' (SFEN). However, the

CFA results for individual constructs suggested rejection of the 'Environmental Factors' (SFEN); therefore, the first-order CFA was operationalised with only two variables. The model was run and the results indicated that the overall fit indices fell outside the desired values. This suggested inappropriate model fit and required re-specification (Appendix E21).

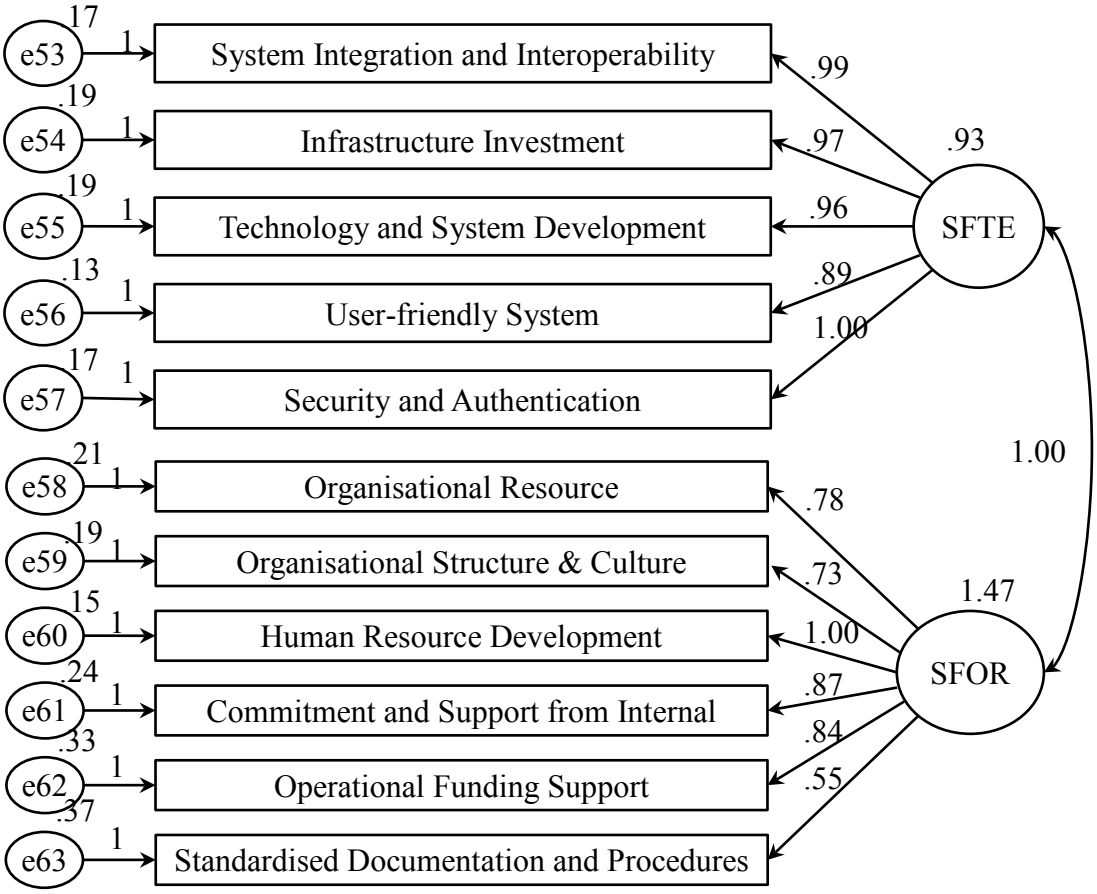

Figure 6.18 First-Order CFA for Initial Measurement Model of 'Success Factors'

An examination of factor loadings suggested to drop the three items of SFORE (Operational funding), SFORB (Organisational structure) and SFORF (Standardised documentation). These items were removed and the model was retested. The removal of three items yielded significant improvement (Appendix E21). The results demonstrated that multiple indices fell well within the expected ranges, which confirmed good (near perfect) model fit.

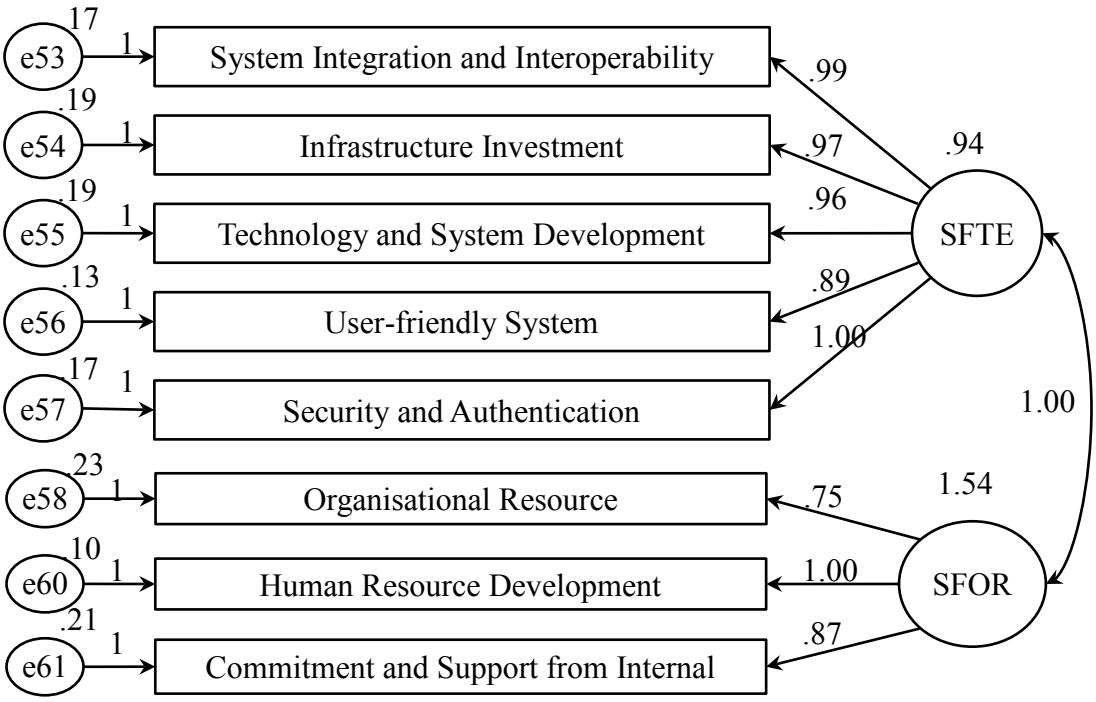

Figure 6.19 First-Order CFA of Modified Measurement Model for 'Success Factors'

In a similar approach to the first-order CFA, both SFTE and SFTO were modelled as causal variables (second-order) of Success Factors (SUCF). The second-order was tested and it resulted in a less than adequate model fit.

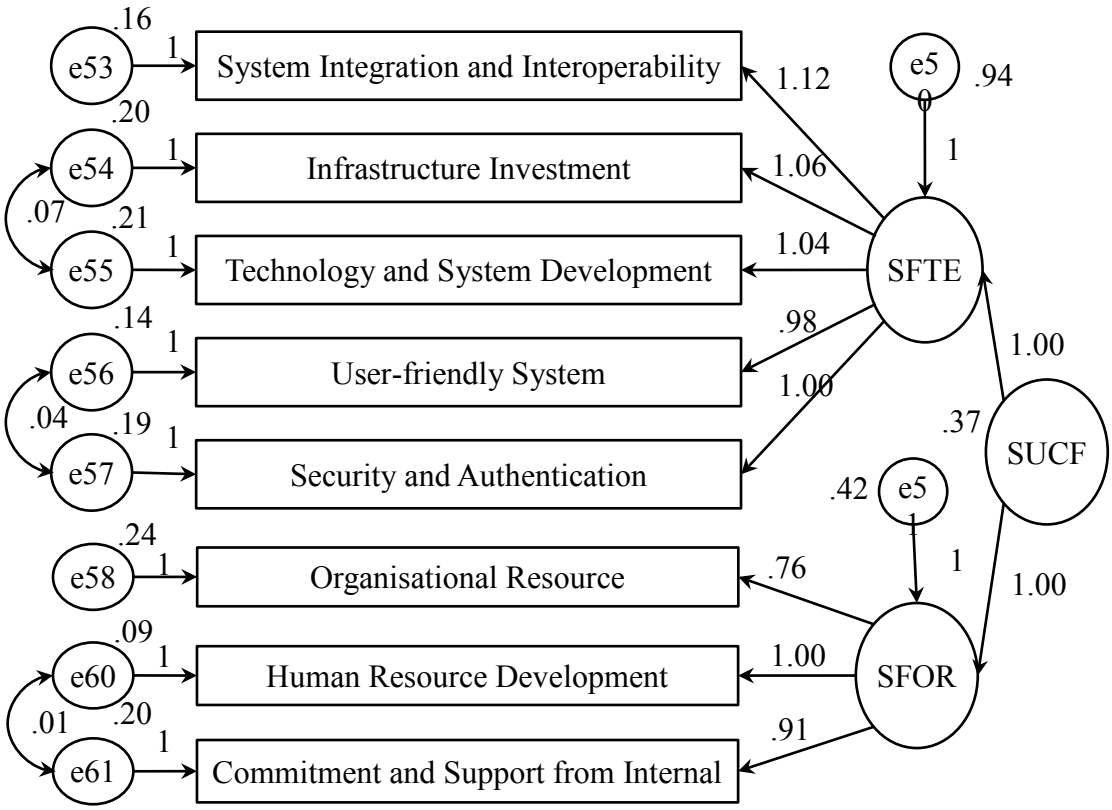

Figure 6.20 Second-Order CFA of 'Success Factors'

Taking into consideration the modification indices (MIs), there were three possible correlations of error terms that could improve the model. They were correlated and added into the model for re-examination using CFA, as shown in Figure 6.20. The measurement model achieved the expected levels for fit indices.

Table 6.11 GFIs for Second-Order CFA of 'Success Factors'

	Estimate	**Goodness–of-Fit Indices**
SFORD <---Organisational Factors	0.876	X^2 = 28.642 ; P = 0.026; CMIN/DF = 1.790; GFI = 0.970; AGFI = 0.932; CFI = 0.991; NFI = 0.980; TLI = 0.984; RMSEA = 0.060; Standardised RMR = 0.0243
SFORC <---Organisational Factors	0.947	
SFORA <---Organisational Factors	0.813	
SFTEE <---Technological Factors	0.828	
SFTED <---Technological Factors	0.860	
SFTEC <---Technological Factors	0.826	
SFTEB <---Technological Factors	0.832	
SFTEA <---Technological Factors	0.875	

Following that, the assessment for validity and reliability of the model was undertaken. It is evident from the table that the values for AVE, CR and Cronbach's alpha of all constructs in the model were well within the accepted values. Thus, the results assured reliability of the items in the model.

Table 6.12 Reliability Results of the Measurement Model for 'Success Factors'

Reflective Construct	Items/ Indicators	Standardised Loading	Construct Reliability (CR)	Average Variance Extracted (AVE)	Cronbach's Alpha
SFOR	SFORD	0.876	0.722	0.669	0.929
	SFORC	0.947			
	SFORA	0.813			
SFTE	SFTEE	0.828	0.880	0.839	0.906
	SFTED	0.86			
	SFTEC	0.826			
	SFTEB	0.832			
	SFTEA	0.875			

From the CFA, construct validity of all the constructs also indicated a good fit to the model. For item reliability, factor loadings fell above the accepted value of 0.50, confirming convergent validity. In summary, both validity and reliability of all constructs in the model were confirmed.

6.5.5 Measurement Model of 'Quality'

The measurement model 'Quality' was operationalised and developed from six constructs (first-order). These were 'Professionalism' (PROF), 'Processing' (PROC), 'Training' (TRAI), 'Specification' (SPEC), 'Content' (CONT) and 'Usability' (USAB). The measurement model 'Professionalism' was built from nine items. All nine items in the model were examined using CFA. The results revealed poor fit of the data. Therefore, further modification was conducted to improve model fit.

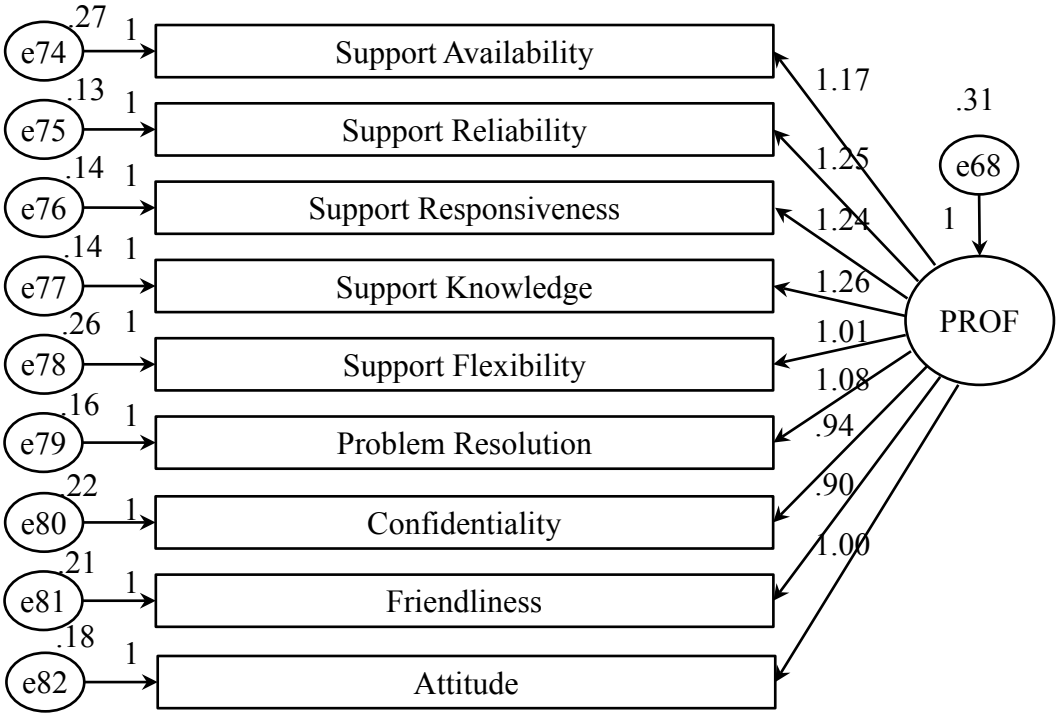

Figure 6.21 Measurement Model of 'Professionalism'

Based on the standardised residual covariance and modification indices (MI), the CFA model for 'Professionalism' was re-specified several times. The review of the MIs suggested that eleven error covariance parameters should be added to the model for better fit. The results of re-specification indicated adequate model fit to the data (Appendix E22).

The measurement model for 'Processing' consisted of seven observed items. It was tested and the results indicated poor fit that required modification (Appendix E23).

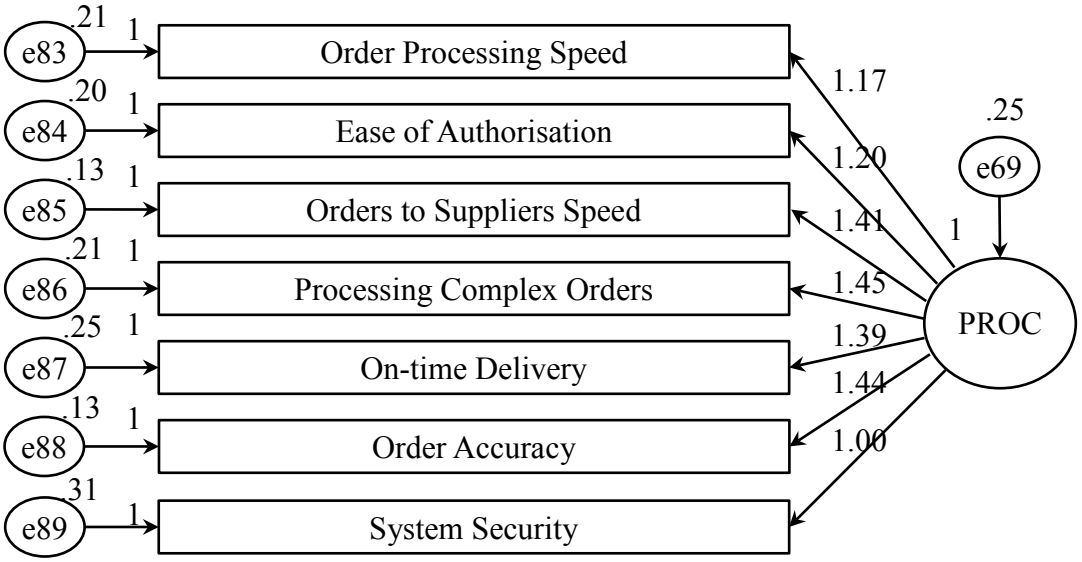

Figure 6.22 Measurement Model of 'Processing'

Examination of the loading signified that the standardised regression weight for PROCG (System security) was low; the decision was made to remove this item because it was deemed to be insignificant. The model was re-examined and still yielded poor model fit. Further inspection of the modification indices showed high co-variances between four error terms. The error covariance parameters were included in a modified model to be re-examined via CFA (Appendix E23). The modification resulted in an adequate level of fit between the data and the model.

The measurement model 'Training' was developed using only three items. The results of the fit test showed a saturated model, otherwise known as a just-identified model, with df zero and a chi-square statistic of zero. Thus, this model will always produce a GFI of 1, and all the co-variances will always be zero. While the model can be run, it cannot be further tested for goodness-of-fit because the results will always be the same. However, examination of the items loading indicated that all were significant and, therefore, the uni-dimensionality of the model was confirmed. Given that the majority of the constructs of 'Quality' have more than three indicators, the just-identified construct of 'Training' is considered to be acceptable (Hair, Black *et al.,* 2006). Therefore, it can be assumed that the model is a near perfect fit to the data.

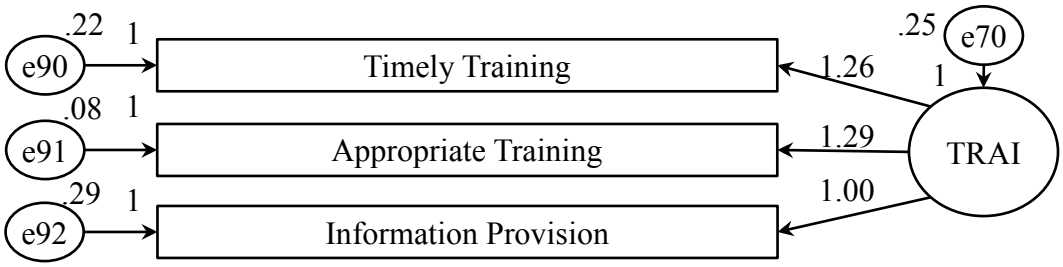

Figure 6.23 Measurement Model of 'Training'

The measurement model 'Specification' also was operationalised with three items. Like the previous measurement model of 'Training', the model of 'Specification' was just-identified. The model cannot be further tested for goodness-of-fit. However, the evidence of the model's uni-dimensionality demonstrates the significant high factor loadings. Despite the just-identified model, the three-item construct of 'Specification' can be accepted.

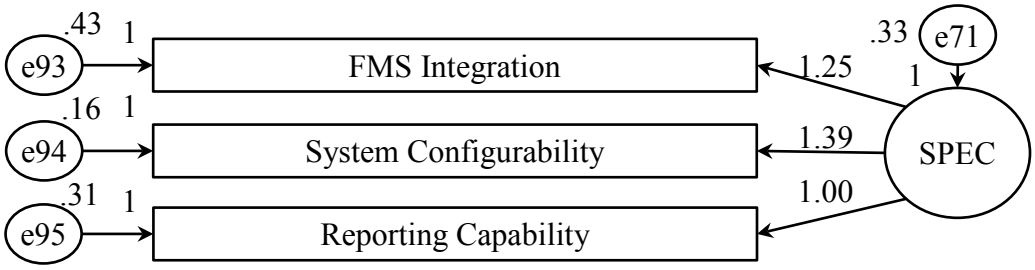

Figure 6.24 Measurement Model of 'Specification'

The measurement model of 'Content' was initiated by three items. As the number of parameters were the same as the numbers of variances and co-variances, this model was just-identified. It cannot be tested for goodness-of-fit statistics. However, the model can be accepted.

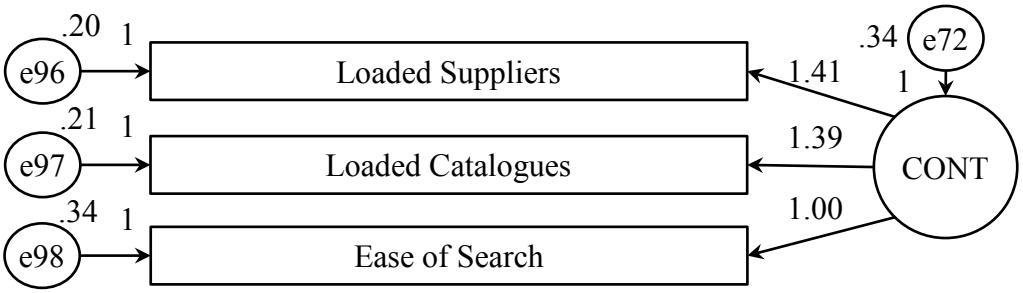

Figure 6.25 Measurement Model of 'Content'

The measurement model 'Usability' also is a just-identified model because it was operationalised by only three variables. The test of goodness-of-fit cannot be computed in AMOS and further analysis cannot be provided. However, it can be assumed that the model should fit the data perfectly.

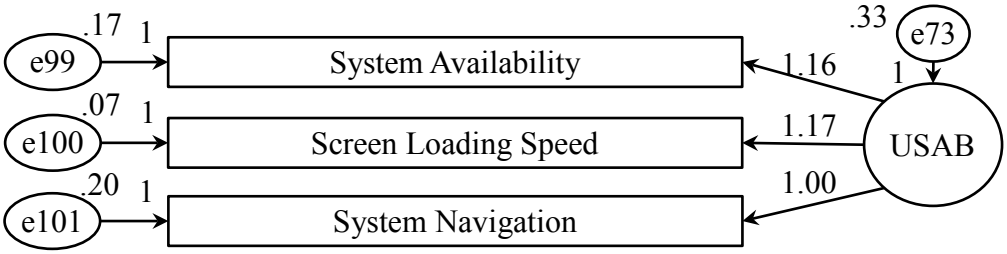

Figure 6.26 Measurement Model of 'Usability'

In the first-order CFA of the measurement model 'Quality', all constructs (first-order) were incorporated to assess model fit. These constructs were 'Professionalism' (PROF), 'Processing' (PROC), 'Training' (TRAI), 'Specification' (SPEC), 'Content' (CONT) and 'Usability' (USAB). Only one item, PROCG (System security) was dropped, as recommended by the CFA. The review of CFA results demonstrated a poor model fit. It suggested that modifications were required to improve model fit (Appendix E24).

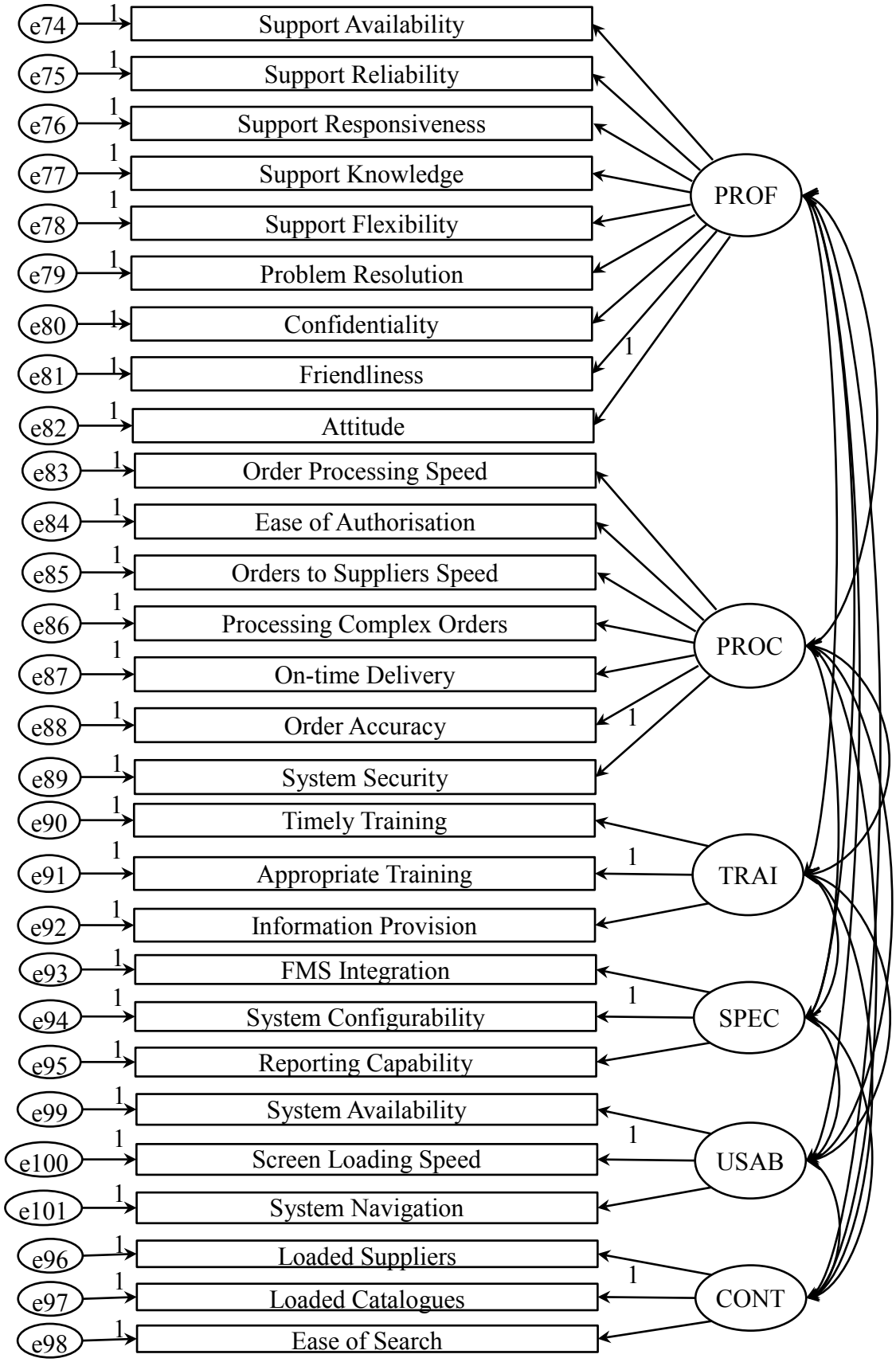

Figure 6.27 First-Order CFA of Measurement Model for 'Quality'

The results of initial CFA were examined to determine whether there was a need for modification. Modification was conducted by examining the subscale measures that indicated low standardised factor loadings, which then had to be removed from the model. Any items that demonstrated significant cross-loadings on more than three factors were dropped as well. From a detailed review of the standard loadings, it was apparent that many items were significantly cross-loaded. Detailed examination of the standardised residual covariance of each item indicated fifteen that showed unacceptably high values. From the Processing (PROC) constructs, four items were deleted, while five items were dropped from the Professionalism (PROF) constructs. Further findings indicated that all items in Training (TRAI) and Specification (SPEC) demonstrated high standardised residual covariance. Thus, the decision was made to iteratively delete each of these items. The final modified model showed more simplified constructs, with only twelve items remaining. Following that, the model was retested using CFA.

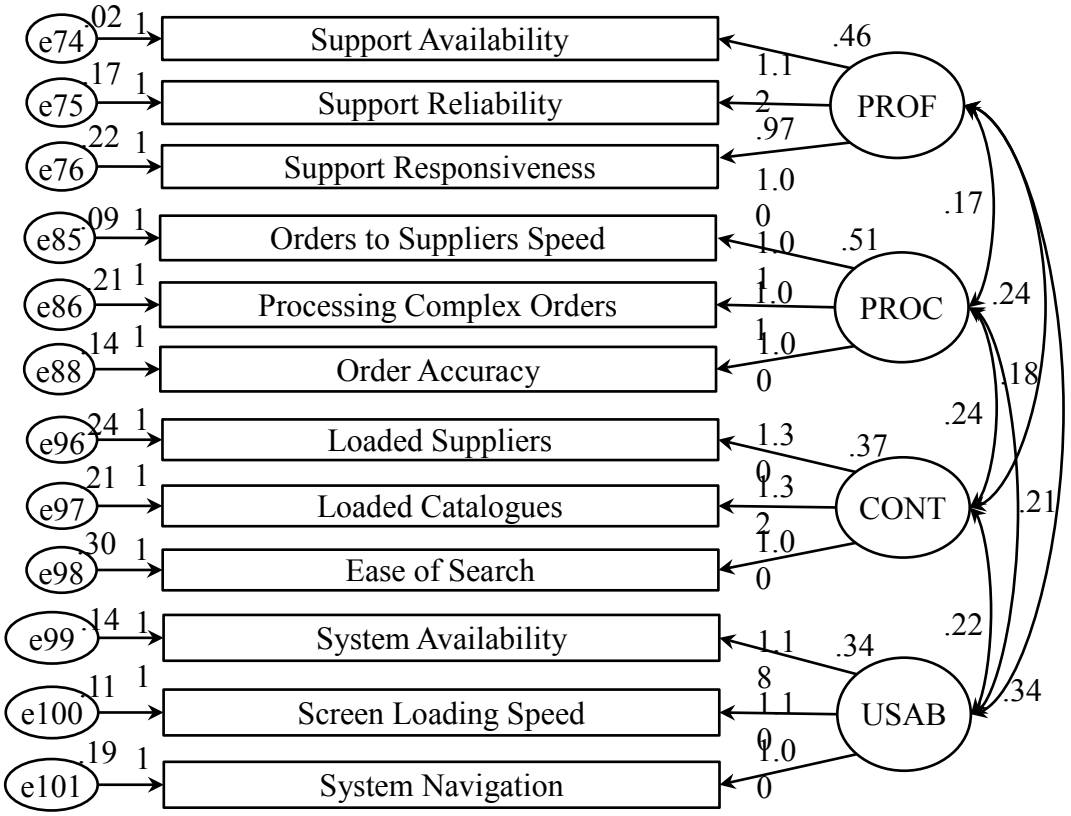

Figure 6.28 First-Order CFA of Re-specified Measurement Model for 'Quality'

The re-specified model met the expected levels of fit indices. The results showed that more than half of the 'Quality' items could be removed, without significantly impacting on the model's applicability. That is, these factors were shown to not be significantly contributing to the quality of e-procurement adoption (Appendix E24).

The second-order CFA was initiated with the twelve scale items from the four constructs, which were derived from the first-order CFA output. The results exhibited that the model was less than adequate in its fit. To obtain an acceptable model fit, post hoc model-fitting procedures were undertaken. An examination of the MIs of the model signified four possible correlations of error variances. Thus, the items were allowed to covary and were tested via CFA (Appendix E25). The results suggested model fit improvement, since multiple fit indices fell within acceptable levels. Thus, the model should be viable for further analysis.

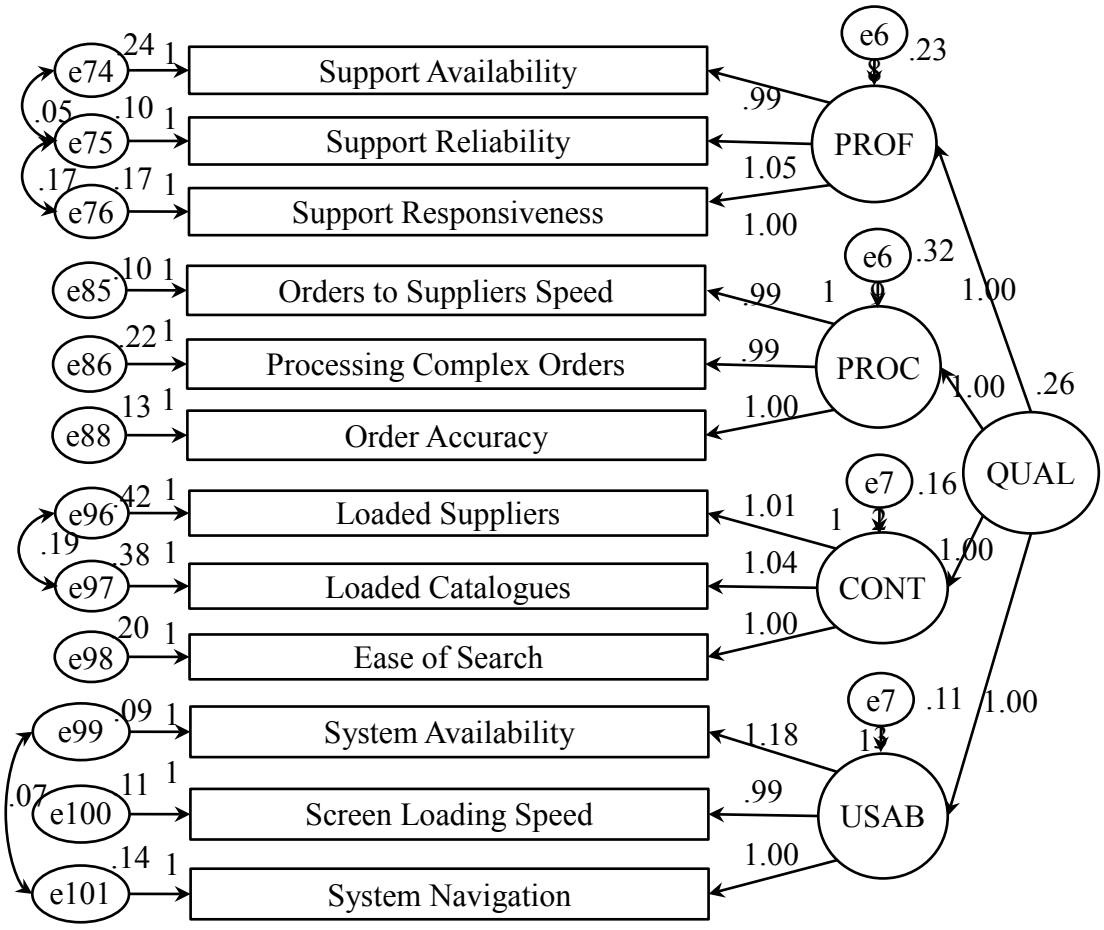

Figure 6.29 Second-Order CFA of Measurement Model for 'Quality'

The reliability and validity of each of the constructs were examined before testing the hypotheses. In total, there are twelve items within the four constructs of PROC (Processing), PROF (Professionalism), CONT (Content) and USAB (Usability). A summary of the reliability and validity is presented in Table 6.13.

Table 6.13 Validity and Reliability of Measurement Model for 'Quality'

Reflective Construct	Items/ Indicators	Standardised Loading	Construct Reliability (CR)	Average Variance Extracted (AVE)	Cronbach's Alpha
PROF	PROFA	0.814	0.898	0.868	0.911
	PROFC	0.860			
	PROFB	0.915			
PROC	PROCF	0.903	0.956	0.895	0.913
	PROCD	0.850			
	PROCC	0.925			
CONT	CONTC	0.822	0.801	0.699	0.857
	CONTB	0.734			
	CONTA	0.712			
USAB	USABC	0.853	0.908	0.884	0.889
	USABB	0.847			
	USABA	0.926			

It was apparent that the CR values for all constructs were within the acceptable range. Likewise, all constructs also exhibited AVE and Cronbach's alpha values that scored well above the requirements. These results support the reliability of all constructs in the model. Likewise, all multiple fit indices from the final measurement model indicated good model fit, and construct validity. In addition, factor loadings for all constructs fell well above the threshold of 0.50, which was considered as an acceptable measure. In summary, validity of the constructs in the model was achieved.

6.5.6 Measurement Model of 'Adoption'

The measurement model of the 'Adoption' constructs was developed from four indicators, which included ADOPA (Nature of use), ADOPB (Navigation patterns), ADOPC (Number of visits) and ADOPD (Number of transactions). The model was

examined using CFA to test how well the model fit the data.

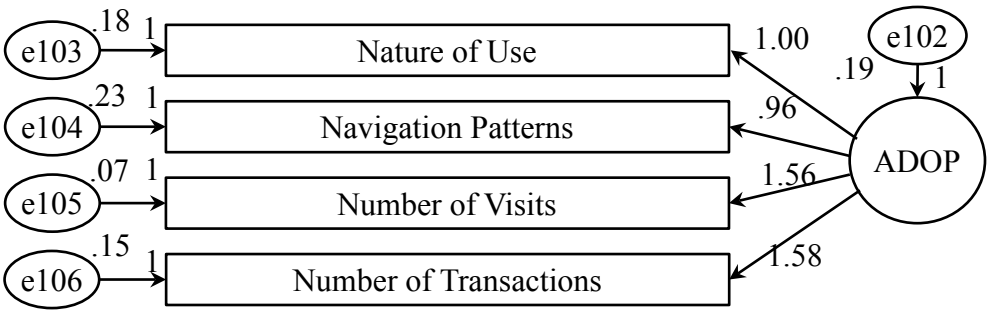

Figure 6.30 Measurement Model for Analysis of 'Adoption'

The results of initial measurement of the model indicated a poor model fit (Appendix E26). To improve the model fit, a post-hoc examination was performed by/after fitting the model to a modified model. An inspection of the modification indices revealed that error variables for item ADOPA and ADOPB was permitted to correlate. The new added path was included in the model for CFA. It was evident from the AMOS output that multiple fit indices assured the model fit to the data (Appendix E26).

The reliability of the construct was identified from the values of CR, AVE and Cronbach's alpha. The results, therefore, signified the reliability of the construct in the model. Further analysis for validity was performed by examining its construct validity and convergent validity.

Table 6.14 Validity and Reliability of Measurement Model for 'Quality'

Reflective Construct	Items/ Indicators	Standardised Loading	Construct Reliability (CR)	Average Variance Extracted (AVE)	Cronbach's Alpha
ADOP	ADOPA	0.864	0.867	0.809	0.877
	ADOPB	0.96			
	ADOPC	0.612			
	ADOPD	0.684			

To indicate the construct validity, all multiple fit indices from the final CFA were reviewed. Notably, the multiple fit indices showed a good model fit and indicated satisfactory measures of construct validity. Additionally, all items demonstrated

factor loadings above the thresholds. Thus, it was considered that the reliability and validity of the measurement model 'Adoption' was verified and fulfilled.

6.6 Structural Model Analysis and Tests

This section discusses the second stage of SEM that was undertaken by performing CFA to examine the structural model. The structural model for 'e-procurement adoption' is comprised of 49 observable variables and 13 unobserved variables within 6 constructs, all of which are endogenous factors and five of which are higher order constructs (BENE, COST, RISK, SUCF and QUAL). Before conducting path analysis, the structural model will be examined for model fit. Following that, the hypothesis testing will be performed by examining the parameter estimates, together with coefficient values.

6.6.1 Structural Model Fit Indices (Structural Model - Hypothesised Model)

The second stage examined the theorised relationships of the structural model by superimposing the hypothesised structural model onto the final measurement model. The structural model was tested for model fit via CFA and yielded poor fit indices. The fit indices indicated the need for model revision. Thus, the standardised loading estimates were examined.

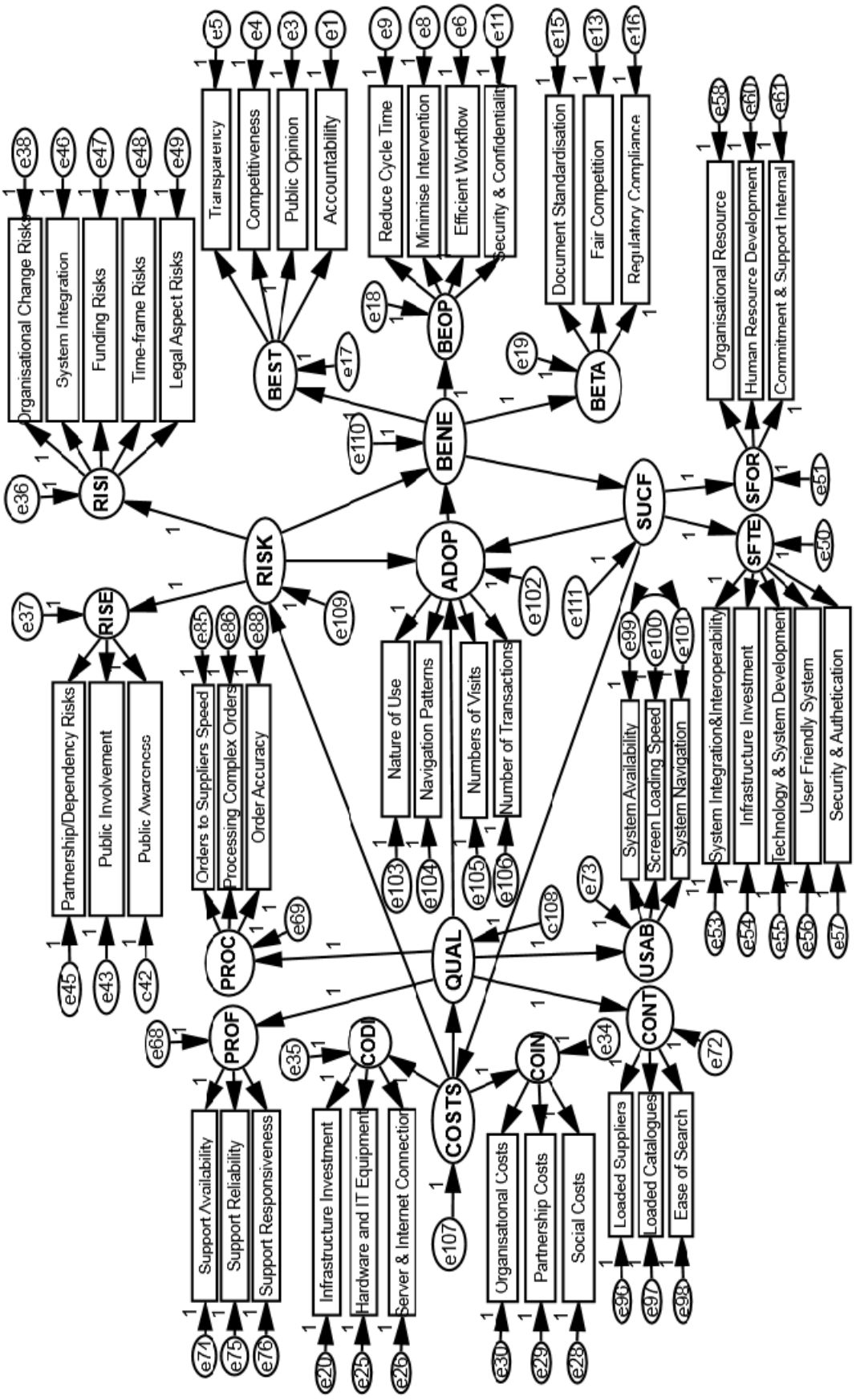

Figure 6.31 Structural Model for E-Procurement Adoption

In reviewing and modifying the structural model, similar approaches to those used for the measurement model were employed. The review of the MIs indicated that several modifications needed to be made to the hypothesised model by correlating the error terms with similar items (Appendix E27). The modified structural model was retested using CFA. The results showed multiple fit indices, which demonstrated a reasonable model fit. These results, therefore, indicated that the hypothesised structural model fit the observed data and so could be retained for testing the hypotheses, which is discussed in the following section.

6.6.2 Testing the Structural Paths and Hypotheses

The previous section demonstrated that the hypothesised research model indicated good fit to the observed data, resulting in the acceptance of the final structural model. However, good model fit alone is not sufficient to support the structural theory. It is important to examine the individual parameter estimates for each specific hypothesis. This section discusses the path analysis and testing of the hypotheses by examining the sign, size and significance of the coefficient paths of the structural model. In this research, there were nine hypotheses posited to be tested using the structural model, as listed in Table 6.15.

Table 6.15 Hypothesised Paths

No	Hypothesised Paths	Hypotheses
H1	Costs ---> Risks	The greater the costs incurred for e-procurement, the greater are the risks that may be imposed
H2	Costs ---> Quality	The greater the costs incurred for e-procurement, the better is the quality of the system
H3	Quality ---> Adoption	The better the quality of the system, the better is the adoption of e-procurement
H4	Risks ---> Adoption	The greater the risks of e-procurement, the lower is the adoption of e-procurement
H5	Risks ---> Benefits	The greater the risks of e-procurement, the lower are the benefits acquired
H6	Benefits ---> Success factors	The greater the benefits of adoption, the wider are the success factors
H7	Success factors ---> Adoption	The wider the success factors, the better is the adoption of e-procurement
H8	Success factors ---> Costs	The wider the success factors, the higher are the costs required
H9	Adoption ---> Benefits	The higher the level of e-procurement adoption, the higher are the benefits acquired

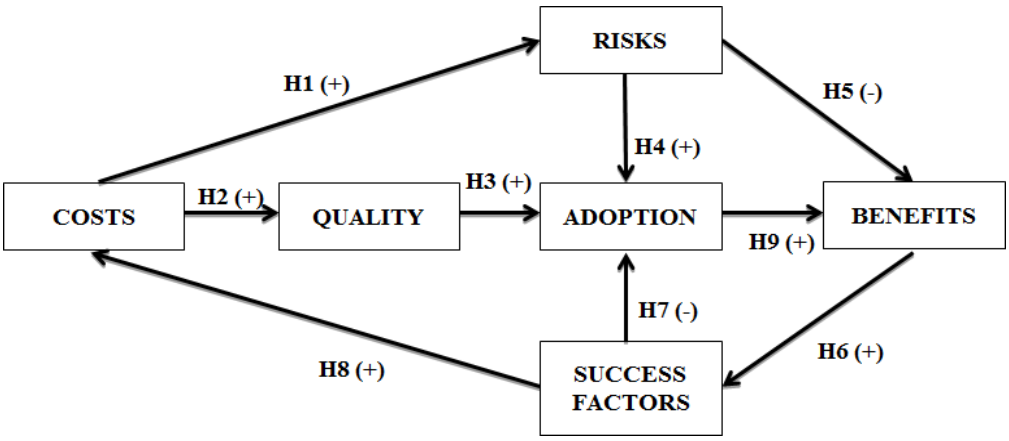

Figure 6.32 Hypothesised Model of E-Procurement Adoption

The strength of the relationships among latent factors can be seen from the path coefficients and the variance explained (R2 value) by each dependent variable. A higher path coefficient indicates a stronger causal effect between the variables (Hair et al., 2006). According to Kline (2005), the standardised path coefficients with absolute value < 0.10, 0.30 and 0.50 indicate very low effect, medium effect and large effect, respectively. Accordingly, the threshold (> 0.10) is defined as the base for interpreting the effects of the standardised path coefficients.

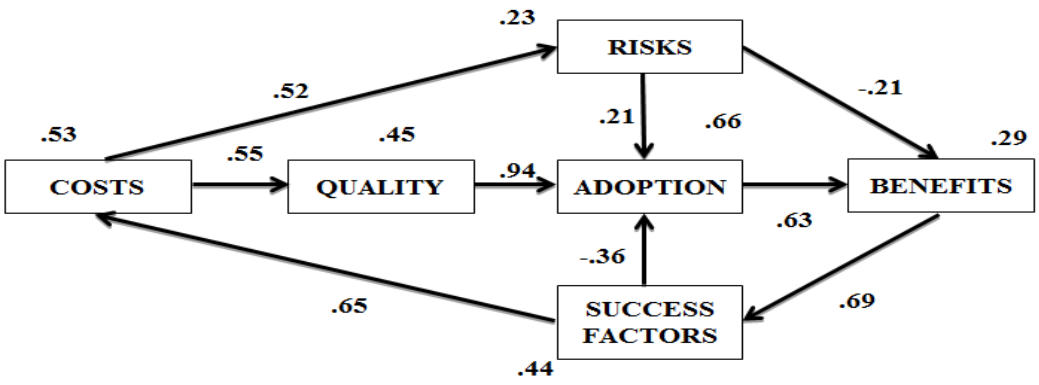

Figure 6.33 Path Coefficients and the Variance Explained (R^2 value) of the Hypothesised Model

A review of the standardised solutions revealed that all nine of the paths among the latent factors were found to be statistically significant and in the hypothesised directions (see Figure 6.33). The standardised estimates for hypotheses H1, H2, H3, H4, H5, H6, H7, H8 and H9 were significant above 0.20 at $p < 0.001$ ($\beta = 0.52$, 0.55, 0.94, -0.21, 0.21, 0.69, -0.36, 0.65 and 0.63, respectively). Therefore, all of the hypotheses are supported.

Table 6.16 Summary of Structural Model Results in Relation to Research Model Hypotheses

No.	Hypothesised Path	Hypothesis	Direction	Path Coefficient (β)	Supported/Not Supported
H1	Costs ---> Risks	The greater the costs incurred for e-procurement, the greater are the risks that may be imposed	+	0.52	Supported
H2	Costs ---> Quality	The greater the costs incurred for e-procurement, the better is the quality of the system	+	0.55	Supported
H3	Quality ---> Adoption	The better the quality of the system, the better is the adoption of e-procurement	+	0.94	Supported
H4	Risks ---> Adoption	The greater the risks of e-procurement, the lower is the adoption of e-procurement	+	0.21	Supported
H5	Risks ---> Benefits	The greater the risks of e-procurement, the lower are the benefits acquired	-	-0.21	Supported
H6	Benefits ---> Success factors	The greater the benefits of adoption, the wider are the success factors	+	0.69	Supported
H7	Success factors ---> Adoption	The wider the success factors, the better is the adoption of e-procurement	-	-0.36	Supported
H8	Success factors ---> Costs	The wider the success factors, the higher are the costs required	+	0.65	Supported
H9	Adoption ---> Benefits	The higher the level of e-	+	0.63	Supported

		procurement adoption, the higher are the benefits acquired			

*Significant at 0.01 level

6.6.3 Summary of SEM and Hypothesis testing

The data analysis for the quantitative data was performed using SEM to test the hypothesised model. In the SEM, CFA confirmed that the structural model was a good fit to the observed data and, so, it was further utilised to confirm the hypotheses of the study. Attempts were made to modify the initial model, resulting in the final structural model. Initially, the conceptual model consisted of 89 observable variables and 16 unobserved variables, which were derived from the six major constructs of Benefits (BENE), Costs (COST), Risks (RISK), Success Factors (SUCF), Quality (QUAL) and Adoption (ADOP). Based on the suggestions from CFA in the SEM, removal of items was conducted, resulting in nearly half of the observed variables (40) and 3 of the unobserved variables being dropped from the model (Appendix E28). As a consequence, the final structural model was simplified with 49 observed variables and 13 unobserved variables of the 6 constructs. CFA of the final structural model confirmed model fit

The variables dropped as a result of the CFA were indicated as having a non-significant impact on the model. However, results of the qualitative analysis indicated that, for example, within the context of Success Factors there were three factors that were crucial to e-procurement adoption, namely the technological, organisational and environmental factors. Surprisingly, the quantitative analysis in this chapter indicated that the environmental factors were not significant in the structural model. Perhaps what can be interpreted from these seemingly contradictory findings is that awareness of the significance of environmental factors may differ across the social spectrum of Indonesia. The results drawn from the case studies were focused on senior members of staff with a significant body of experience within the field of e-procurement, whereas the survey respondents were drawn from a wider sample, with varying degrees of experience. Other findings from the Quality constructs also indicated that Training (TRAI) and Specification (SPEC) did not

meet the criteria for model fit and, therefore, were excluded from the structural model. Despite some variables being removed from the model, their removal did not impact the structural content of the conceptualised model. Hence, the overall findings indicated that the model was consistent with the theoretical framework and the findings from case studies. The next chapter addresses this issue for further discussion.

This study also proposed nine hypothesised relationships to be tested in the model. The results demonstrate that all nine hypotheses (H1, H2, H3, H4, H5, H6, H7, H8 and H9) are supported and they indicate statistically significant path coefficients in the hypothesised directions. Therefore, findings from this research support the hypothesised relationships between the constructs in the model.

6.7 Chapter Summary

This chapter presented analyses of the quantitative data acquired from an online questionnaire. The data analysis was performed in the three main phases of preliminary analysis, Structural Equation Modelling (SEM) and hypothesis testing. A preliminary analysis was conducted, prior to SEM analysis, in order to ensure that the data met basic assumptions for using SEM. This phase was also concerned with survey administration, response rate, descriptive analysis, data screening, non-response bias testing and the demographics of the respondents. SPSS v.22 was used in this phase to assist the statistical analysis.

In the second phase, a two-stage Structural Equation Modelling was performed using Confirmatory Factor Analysis (CFA) in AMOS version 22.0. This phase included assessment of the measurement model and the structural model. In the first stage, measurement models were developed for each of the latent variables. The models were examined using CFA to confirm the model fit, uni-dimensionality, reliability and validity. Following that, the structural model was established to represent the formulated hypotheses. The structural model was tested via CFA to confirm the best model fit. Modifications were made during CFA that resulted in the removal of some variables. Despite the removals, the model was consistent with the conceptualised

model. Moreover, the structural model also indicated satisfactory model fit to the observed data and, so, was retained for testing the hypotheses. Finally, hypothesis testing was carried out to test the hypothesised structural model. The results showed that all nine of the initially proposed hypotheses (H1, H2, H3, H4, H5, H6, H7, H8 and H9) were supported. Analysis of the paths demonstrated significant coefficients of paths, and those paths were all in the hypothesised directions.

The next chapter discusses the findings from the quantitative analysis developed in this chapter (Chapter 6) and the previous qualitative approach in Chapter 5. These results are triangulated with the literature review (Chapters 2 and 3), and a discussion of the theoretical and practical implications is presented.

CHAPTER 7

AN *EX-ANTE* EVALUATION MODEL FOR SUCCESSFUL PUBLIC E-PROCUREMENT ADOPTION

7.1 Introduction

To date, there have been limited studies and approaches for evaluation of e-procurement in the context of the public sector. To overcome this issue, the main aim of this research was to develop a model to evaluate the adoption of e-procurement for the public sector. The starting point was the conceptual model, based on the literature review, which was further modified through analysis of data collected from fieldwork. In alignment with the literature, five case studies were undertaken to provide insight and deeper understanding of e-procurement adoption evaluation within the public sector. Notably, five cornerstones emerged that are keys to successful public e-procurement adoption: costs, benefits, risks, success factors and quality. Each cornerstone was evaluated to provide explanations to support the proposed model. A model for evaluation of successful adoption was developed that draws on the combination of the five constructs. It then was examined to test the hypotheses and the relationships among constructs.

In this chapter, a model for an *ex-ante* evaluation of the success of e-procurement adoption is discussed, particularly how the derived research findings from the case studies (Chapter 5) and the questionnaire survey (Chapter 6) were used to construct the *ex-ante* evaluation model. This chapter also discusses the contribution that the developed model adds to the body of knowledge on evaluation of e-procurement adoption within the context of the public sector.

7.2 Rationale for an *Ex-ante* Evaluation of E-Procurement Adoption

Many organisations in the public sector have adopted e-procurement technology as a part of their strategic solution to address the many public sector procurement requirements for efficiency and effectiveness in their processes (Barahona *et al*., 2015; Neupane *et al*., 2015). There is a need to make full use of the advantage provided by adopting e-procurement within an organisation. In order to do so, the adoption process requires suitable assessment and evaluation because the investments in e-procurement are complex, time-consuming and costly. The evaluation of e-procurement adoption also enables continuous improvement in public procurement through re-engineering of the process (Brun *et al.*, 2004). Evaluation should include a set of techniques, or a framework, that explores all aspects of e-procurement adoption and that provides necessary feedback to support learning and to further develop the adoption of e-procurement.

It can be observed from the case studies that comprehensive evaluation does not exist and evaluations are not generally well-performed. Some reasons are suggested why organisations have not undertaken formal evaluation of their e-procurement systems.

- Benefits are obvious: the findings from case organisations indicate high confidence in the use of the system, with its benefits being visible and already achieved, so it is not deemed important to undertake formal evaluation. Those benefits sometimes motivated the decision to adopt the system in a speculative way that was considered as an ‘act of faith’. In fact, most decisions fall back on informal ‘gut feeling’ methods of evaluation for e-procurement adoption.
- Previous experience with e-procurement system: Notably, lessons learned and previous experiences with similar systems in many other public sector organisations worldwide had indicated that the system was confirmed and tested. The initiative of public e-procurement adoption in Indonesia was inspired by its successful adoption by many other countries, such as Australia, South Korea and Singapore.
- Time and resources: the findings indicate that evaluation is perceived as a non-valued activity because it is time-consuming and requires extra resources in terms

of funding and personnel, which increases the burden on public organisations.

- Compliance to National Policy: the analysis shows that the decision to adopt the system was 'taken for granted' as part of the national procurement policies. It is demonstrated that e-procurement adoption was initially implemented as a result of statutory regulation in response to the political objectives of the government. It identifies that evaluation of e-procurement initiatives within the public sector has been neglected and that, even when evaluation exists, it is likely to be inefficient and ineffective. It is evident from the findings that evaluation is characterised as non-interactive, hierarchical and bureaucratic.

In addition, this research identifies why such formal evaluation has not been performed during the adoption of e-procurement. This finding is similar to those of many other scholars (Love *et al.,* 2006; Vaidya *et al*., 2006; McCue and Roman, 2012) who found low usage of formal evaluation methods. It is argued that the explanation for this could be that the technology is still in an immature stage, with its own peculiarities (Tonkin, 2003; Basheka *et al.,* 2012), and which, according to Smart (2010), is subject to further refinement. While it is necessary to undertake careful evaluation and assessment of e-procurement, the studies and concepts for such evaluation have not been adequately explored. There is an evident lack of academic studies in the evaluation of public e-procurement that apply an integrated comprehensive evaluation model (Vaidya *et al.* 2004; Shakya, 2015). This is highlighted by the recent review of e-procurement evaluation literature that showed a lack of core constructs and limited scope. Hence, the establishment of a comprehensive model for evaluation of public e-procurement is crucial.

7.2.1 The Need for a Comprehensive Model for Evaluating Public E-Procurement

A limited analysis of e-procurement evaluation has been identified in recent academic studies and business articles. Research studies have already been carried out to evaluate e-procurement adoption over the last two decades. Regardless of the several approaches that have been developed, there has been no generally accepted conceptualisation of e-procurement evaluation. This makes the design or modification of evaluation approaches for e-procurement adoption problematic,

particularly in the public sector context. None of the existing approaches is totally appropriate since not all of the variables, notably the costs, benefits, risks, success factors and quality of e-procurement, were taken into account properly.

The process of evaluation is an iterative process that looks beyond many key themes of e-procurement adoption. By taking a look at various indicators for evaluation, a better understanding of e-procurement adoption can be achieved (Vaidya *et al.,* 2005). Earlier studies have not framed the evaluation determinants, based on multiple dimensions, collectively. Thus, this study was undertaken to develop a comprehensive model to evaluate e-procurement systems more elaborately, considering not only the benefits, but also other key determinants of the costs, risks, success factors and quality of e-procurement, which were not covered by prior studies. This suggests that this model will contribute to the body of knowledge, particularly in the context of the public sector in a developing country, because it was undertaken and verified in relation to Indonesian public e-procurement through the triangulation of case studies and a questionnaire survey. However, the model is generic in nature and can be applicable, with certain adjustments, to the evaluation of public e-procurement worldwide.

7.3 Public E-Procurement Adoption Evaluation Model

This section presents the comprehensive model of public e-procurement adoption evaluation that was confirmed and verified in this study. Notably, it exhibits a number of key determinants that contribute to successful adoption of e-procurement. These include: (1) Costs; (2) Benefits; (3) Risks; (4) Critical Success Factors; and (5) Quality of e-procurement. The key determinants of the proposed conceptual model have been quantitatively validated through the Structural Equation Model (SEM) using Confirmatory Factor Analysis (CFA). Based upon the findings and analyses from the case studies and survey, a model for evaluation of e-procurement adoption can be finalised within the context of the public sector, as presented in Figure 7.1. The final version of this e-procurement adoption evaluation model indicates minor differences from the earlier conceptual model. The disparity generated by the findings could be attributable to the nature of the analysis undertaken and the extent

to which the organisations were experiencing difficulties during adoption of the system. Hence, it is suggested that the final model can substantially improve the evaluation of e-procurement adoption to aid in its successful implementation in the public sector.

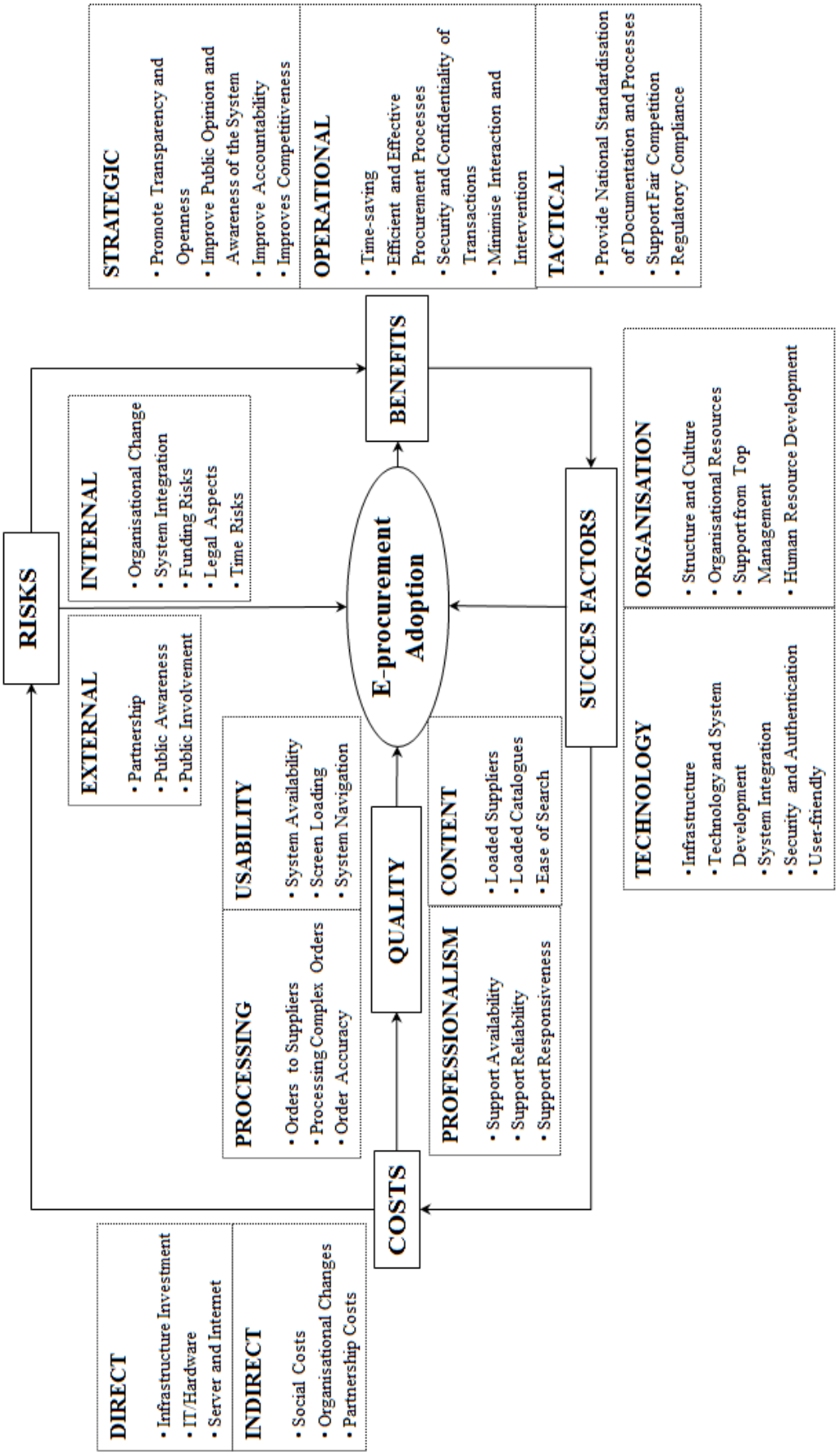

Figure 7.1 The Model for Evaluation of Public E-Procurement Adoption

7.4 Public E-Procurement Adoption Cost Management

Given the fact that e-procurement investments are complex, time-consuming and costly to implement, it is perceived that evaluation of costs has emerged as a key factor for successful e-procurement adoption. By taking the costs aspect of e-procurement into consideration, a better understanding of the adoption process can be achieved. Along a similar line to Love *et al.* (2005), this study suggests that inability to measure costs may hinder the expected benefits from e-procurement adoption. Managing costs, therefore, is essential to ensure successful adoption. It suggests the need to identify, to assess and to control costs arising from any e-procurement initiative.

7.4.1 Cost Identification

In deriving the cost measure, it is suggested that both direct and indirect costs are important to consider in the evaluation process. It was found that the common patterns of costs associated with e-procurement adoption were from technology, organisation and environment. The costs associated with technology and people are characterised as direct costs, while those related to the environment are indirect in nature. From the point of view of technology, costs emerge from initial investment in the technology, as well as ongoing operational and maintenance costs of the e-procurement system. In the organisational context, the costs are derived from organisational activities relating to training, human resource development and salary expenses. Finally, both social costs and required organisational changes are classified as being within the environmental context.

Any costs due to the development, adoption and operation of e-procurement are to be classified as direct costs. The analysis indicates that significant costs accrue from four main themes: IT investment, operational and maintenance costs, human resource development and salary schemes. Capital expenditure is attributed as being the major consideration of cost because the initial investment in e-procurement is significant and is showing yearly increases resulting from greater demands for value from the investment. Findings from the fieldwork suggest that, prior to adoption of e-procurement, the public sector needs to evaluate its technological infrastructure to

ensure adequate technical and organisational support is in place. It was observed that significant costs accrue from operation and maintenance of the systems.

Deploying the technology must also be underpinned by developing human resources through continuous training. Inability to provide sufficient training may undermine the performance and productivity, resulting in another 'IT productivity paradox' of e-procurement. Another effective strategy to improve the professionalism, integrity and morale of the staff, while also reducing opportunities for corruption, is to provide a scheme for better salaries in accordance with the increase in workload and responsibilities.

There is a broader scope of indirect costs, which are not related directly to procurement activities, such as any costs incurred by improving services and partnerships. This encompasses any costs related to human factors, as well as organisational costs. However, these costs are 'hidden' and more difficult to identify, which usually leads to them being underestimated and disregarded. Moreover, indirect costs can be a substantial burden that may be even more significant than the direct costs. With this hindsight, organisations should be cautious about the less visible costs that may lead to e-procurement adoption failure (Love *et al.,* 2005). Notably, such costs were included in this analysis under the three aspects of social, organisational and partnership costs.

Changes within an organisation are required to ensure that the benefits to be gained from any IS/IT implementation are eventually realised and delivered. Specifically, the organisational structure must become leaner and more flexible, such as through the establishment of a procurement unit with discernible roles and objectives in regard to e-procurement. More importantly, this can be achieved through changes in its bureaucratic practices, through the simplification and re-engineering of business (procurement) processes. The re-engineering of the procurement process also entails the need to work together with suppliers to create value-added processes (Farzin and Nezhad, 2010). This study also discovered the need to align the procedures of business partners and all stakeholders through consultation, communication, involvement and resolution of issues, in order to support the fast adoption of e-

procurement. It suggests that the sharing of knowledge and information can be achieved via intensive training of partners.

7.4.2 Cost Assessment and Control

Moon (2005) suggested that greater control over spending on e-procurement activities contributes to achieving maximum e-procurement benefits realisation. After identification and classification of the typical costs arising from e-procurement adoption, the costs can be monitored and controlled by assessing the cost factors underlying each single factor identified, as presented in table 7.1.

Table 7.1 E-Procurement Cost Factors

Type of Cost	**Description**	**Technology**	**People**	**Organisation**	**Cost Factors**
Direct	Infrastructure investment	√			- Installation of hardware and software, server, network and internet connection, and building infrastructure
	Operational and maintenance	√			- Utilities, consumables, stationery, printing, internet connection fees, maintenance and system update costs - Costs for contracting staff and consultants
	Training and human resource development	√			- Training costs in IT, e-procurement systems and procurement legal aspects
	Rewards, incentives and salary scheme		√		- Changes in salaries, staff turnover, incentives, contracting officials and consultants
Indirect	Social			√	- Public involvement, socialisation, publications and documentation
	Organisational changes			√	- Organisational restructuring of additional units, groups and personnel assigned for e-procurement - Changes in processes and business practics

7.5 Public E-Procurement Benefits Realisation Management

The findings and analyses clearly show that e-procurement brings various benefits to public organisations. Although those benefits exist, they do not directly lead to successful e-procurement adoption. The rationale is that, if such benefits can be identified, they can be managed to bring optimum results. Hence, the need to identify, monitor and manage the benefits from e-procurement in the public sector is being accepted as a way to ensure its successful adoption. The evaluation of e-procurement should be aligned with benefits realisation and management to determine whether the benefits from e-procurement adoption are eventually realised and delivered. From the literature, various approaches and models have been developed to assist organisations. Similar to Lin *et al*. (2007), this study proposed a three–step process to perform benefits realisation and management. These steps include identification of the benefits, planning and monitoring of benefits realisation, and benefits evaluation and review.

7.5.1 Identification of E-procurement Benefits

In evaluating the benefits of e-procurement, this study attempted to identify and classify benefits into the three main categories of strategic, operational and tactical benefits, which appear to have been achieved through e-procurement adoption in the Indonesian public sector (Piotrowicz and Irani, 2009). These categories were adopted as part of the evaluation model, as proposed earlier. This identification and classification of benefits is useful in arranging any possible actions for benefits realisation and management arising from e-procurement adoption.

In term of strategic benefits, four key themes emerged from the analysis of both case studies and questionnaires. They were transparency, accountability, competitiveness and public opinion. Transparency was a theme that recurred throughout the analysis and it reflects the growing importance that this dimension is given in public e-procurement. E-procurement, in a broader sense, ensures the highest circulation of information throughout the system and via the internet. Openness in procurement provides a wider span of control, more opportunities and the convenience of procuring via online systems (Transparency International, 2013).

E-procurement is a strategic means of promoting fair competition in one wide market for the procurement of goods and services. It offers great potential to improve the competitiveness of stakeholders, not only on a national scale but also globally (Khorana, Ferguson-Boucher and Kerr, 2015). Additionally, e-procurement has been identified as an enabling technology that can leverage the accountability of public procurement activities (Hardy and Williams, 2008; Varney, 2011). At this point, the open system via the internet enables wider involvement of the public to monitor and to control the procurement activities and processes. This study revealed that e-procurement in Indonesia has received a positive response and has raised public confidence in public procurement (Shayka, 2015).

In addition, four operational benefits were confirmed as being significant: security and confidentiality, time-saving, effective and efficient processing, and minimisation of intervention. Due to the open nature of the internet and the sensitivity of the government's data and transactions, system security was found to be critical. It requires certain mechanisms for identifying and authenticating data to ensure the security of data and transactions (Mozaffari *et al,* 2012). Procedures and mechanisms have been developed over the years in order to ensure the trustworthiness of such systems, including encryption of documents, the use of digital signatures and the deployment of authentication procedures. In addition, e-procurement has been an enabling mechanism in bureaucracy reduction, process simplification and time-saving because all activities are fully conducted through the internet (Gardenal, 2010; Yu *et al.* 2015). This study analysis suggests that e-procurement contributes to the elimination of non-value-added activities in procurement (Piotrowicz and Irani, 2010; Johnson, 2011).

E-procurement also has proven to be an effective means of procurement because it redefines and re-engineers the procurement processes (Farzin and Nezhad, 2010). As a result, public organisations have achieved better time management because all documents are submitted directly into the system, which also generates savings due to the paperless transactions. Further, public procurement has been found to be prone to fraud, misconduct and many kinds of intervention from internal and external

parties (Shakya, 2015). For instance, favouritism can occur when a contract is awarded to a preselected supplier through violation of the requirements and principles of fair competition, often with the intention of gaining personal benefits. However, in reinforcement of the literature, this analysis revealed that e-procurement is capable of minimising such indiscretion in practices, which would contribute to building confidence and trust in the system (Neupane, Soar and Vaidya, 2014).

In the context of tactical benefits, this study reinforced the contentions made in the existing literature that e-procurement has the potential to support fair competition, provide procurement standardisation and fulfil regulatory compliance requirements. E-procurement is underpinned by the principles of equity, non-discrimination and fair dealing. Notably, public e-procurement can play an important role in stimulating the highest level of market competition, which enables a wider level of organisational and supplier participation (Rita and Krapfel, 2015). In its broader sense, a highlight of e-procurement is that it can create open access to procurement activities without any geographical boundaries. To support that, standardisation of documentation and procedures is necessary; templates must be made explicit to reduce the potential for misconduct, containing clear information, standard specifications and any legal rules governing the documents (Varney, 2011). E-procurement offers standardisation that is characterised as being exchangeable and consisting of reusable information that avoids rework. It also has been found to provide, and to integrate, a common standard for products and an automated workflow process nationwide. The use of a common standard increases regulatory compliance and enables public entities, with various jurisdictions, and their suppliers to interoperate (Neupane *et al.* 2012).

7.5.2 Benefits Realisation Plan

A benefits realisation plan is developed to guide e-procurement adoption and to review its achievement and progress, with the aim of ensuring the delivery of benefits. This includes measuring and tracking the identified benefits and incorporating the plans into the organisation's business case. The plan focuses on the strategy and actions required to realise the benefits in order to satisfy both the

organisation and all stakeholders. In line with Eakin (2002), the suggested steps required to develop a benefits realisation plan are:

- Define the Key Performance Indicators (KPIs) that are to be monitored throughout the adoption of e-procurement;
- Define the measurement baseline and develop the metric applications; and
- Visibly measure and visibly report.

This study also developed a metric for benefits realisation management, as shown in Table 7.2. The KPI's presented in the metrics are representative only in that they can be expanded in accordance with a specific e-procurement strategy.

Table 7.2 Benefits Realisation and Management Metrics

Classification	Metric	Key Performance Indicator (KPI)
Strategic Benefits (see Table 5.7)	Improvement in competitiveness	• Number of transactions carried out through e-procurement system • Number of tender documents • Number of vendors in database • Level of supplier participation
	Transparency	• Number of transactions/tenders/ notices published online • Level of access to public information and documents (number of documents downloaded and uploaded)
	Accountability	• Level of perceived employee accountability (number of customer complaints) • Percentage of satisfied customers • System availability (amount of total system downtime)
	Improvement in public opinion	• Percentage of satisfied customers • Level of access to public information and documents (number of documents downloaded and uploaded) • Level of service quality
Operational Benefits (see Table 5.7)	Time-saving	• Average time required to complete tender process • Reduced order fulfilment time • Standardisation of processes and documents (number of documents available in the system)
	Efficient and effective procurement	• Percentage of transaction cost saving • Average cost of a bidding process • Total procurement costs
	Security and confidentiality	• Number of system failures (amount of total system downtime) • System availability • System reliability • Number of issues resolved • E-procurement tools provided
	Reduction of intervention	• Level of effective communication achieved (number of e-mails and messages received via the system) • Level of compliance • Level of user satisfaction
Tactical	Standardisation of	• Standardisation of processes and

Benefits (see Table 5.7)	documentation and processes	documents • Level of access to public information and documents
	Enhancement of fair competition among vendors	• Number of competitive tenders carried out throughout the system • Level of facilitation of competition
	Regulatory compliance	• Level of compliance • Effectiveness of helpdesk (number of queries and follow-ups) • Percentage of satisfied customers and users

7.5.3 Monitoring and Evaluation of Benefits

The effectiveness of a benefits realisation plan highly depends on its ability to monitor and to evaluate the results, in order to ensure that the expected benefits have been realised. A benefits review can be used for organisational learning because it also provides any necessary changes in the business case. Organisational learning refers to the way public organisations can learn from best practices, and lessons learned from previous history, about how to deliver the expected benefits from the adoption of any new activity, in this case, e-procurement (Salonen, 2015).

7.6 Public E-procurement Adoption Risk Management

While the public sector can obtain significant benefits from e-procurement, there is, however, a certain amount of risk that, if not identified and managed properly, may shave the potential value of e-procurement. Along a similar line to that noted by Birks *et al.* (2001), our analysis also suggested the need to include necessary actions to manage the risks of e-procurement into the business case processes, in order to ensure full realisation of the benefits from its adoption. This study also revealed that the benefits of e-procurement far outweigh its risks (see table 6.16 and Figure 6.33). Any possible risks can be dealt with if an organisation manages to provide a risk management plan and to carry out procedures according to that plan. Risk evaluation and management has been considered as a key aspect of the successful delivery of e-procurement. As risks evolve over time, managing risk is about ongoing activities rather than resolving a one-off issue and, therefore, it is crucial throughout the entire

system life-cycle. This study suggests that managing e-procurement risks can be performed into two main phases, including risk identification and classification, and risk control and management. A brief detail of the two phases is presented in the next subsections.

7.6.1 Risk Classification

A taxonomy has been developed, categorising the risks identified from the literature review and verified by both interviews and questionnaires, to provide a means of risk classification. Notably, this study defines the risks within the two categories of 'internal' and 'external'. The internal risks were identified as being associated with the technological, human and organisational factors of e-procurement adoption, whereas the external risks emerged as the impacts of partnerships and surrounding environmental uncertainties. The taxonomy can be of practical use as guidance for further improvement of our understanding of risks and for designing any actions required to manage those risks.

In regard to internal risks, the analysis confirmed the significance of risks related to organisational factors, which include funding risks, organisational changes and legal aspects. To our surprise, many major risks like system failure and system security (see page 157) were not found to be significant risks for e-procurement adoption (Dorasamy, 2013; Milovanović *et al*, 2013). It should be borne in mind that this may imply that current practices have been effective in lessening such risks and have moved to the final stage of its maturity. Further, system integration and processing time were attributed as being crucial technological risks.

This suggests the need to evaluate information technology infrastructures to ensure that they are compatible with e-procurement applications and the possibility of integrating them properly. It can be considered that the establishment of standardisation is essential to ensure that the system can function properly, including its technical and system specifications, process and procedure guidelines, and the issue of security coding. A clear conclusion from the analysis is that process efficiency and process integration must be in place to meet the demand for a shorter lead time. In order to ensure system integration, training and education also was

found to be important.

Moreover, e-procurement can only deliver the expected benefits if such changes exist across all involved organisations, including the restructuring and re-engineering of existing business processes for dealing with procurement. Hence, collective commitment for change in organisational structures and processes is regarded as being vital to the successful delivery of e-procurement. Along a similar line, the existence of legal regulations can be viewed as a prerequisite for ensuring faster adoption.

In the context of external risks, public organisations must take into consideration the fact that there is less internal control over e-procurement due to uncertainty from external factors. This type of risk can be a manifestation of partnerships, the environment and/or economic factors. The analysis, through model testing, confirmed the external risks from partnership uncertainties, as well as public awareness and involvement. A careful assessment of external risks is crucial because an organisation has less control over its partners and the surrounding environment. On the flip side of e-procurement adoption, there is also high dependency on external partners. E-procurement systems must be integrated, not only within the internal information system, but also with the systems of partners and suppliers. Building up effective communication and coordination with suppliers can play a vital role in reducing the risks. To embrace e-procurement, the training and education of suppliers also was seen to be important in improving suppliers' readiness levels.

In addition, the public will be the final beneficiaries who will receive the benefits from e-procurement services. As a consequence, it is important to gain the public's trust and support in regard to e-procurement. This suggests that sufficient public knowledge about e-procurement and its benefits can contribute to a higher level of e-procurement adoption. The success of the project also depends on communication and public involvement to monitor and to control e-procurement processes.

7.6.2 Risk Control/Management

In order to reap the maximum benefits of e-procurement, following the identification of a risk taxonomy, the next crucial activity is to control and to manage the risks (Love *et al.* 2005). Effective control systems can be very important to mitigate the risks. Reinforcing the literature (Premkumar *et al.* , 2005), the findings from five case studies suggests the need to examine the risks that public organisations may encounter during adoption, along with the controls that can be utilised to develop management strategies (see page131). In this study, the controls can be viewed as the measures taken by an organisation to manage, mitigate and eliminate any risks that may occur, which can be due to a procedure, system, process or device at varying levels of risk. An attempt was made to develop control systems for the identified risks in our analysis, as presented in Table 7.3.

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Table 7.3 Risk Control and Management

Classification	Risk	Risk Control
Internal	Organisational change	• Establish structured policy for roles, responsibilities and obligations • Develop a leaner and more flexible organisational structure to support e-procurement services • Focus on simplification and re-engineering of procurement activities • Gain collective commitment from stakeholders to support any changes during adoption
	System integration	• Provide reliable IT infrastructure to support e-procurement services • Make commitment to provide regular training for users and vendors • Implement a standard platform for data security and authentication • Provide a back-up strategy for recovery of system and system updates • Use assistance from experts to avoid integration issues
	Funding	• Gain support and commitment from management and decision-makers for ample funding for e-procurement activities • Focus on quality services and customer satisfaction • Develop funding allocation and strategies to support e-procurement services
	Legal aspect	• Implement standardisation of processes and documentation that are accessible online • Formulate comprehensive regulations governing e-procurement • Provide assistance to stakeholders for legal aspects
	Time	• Focus on process simplification/re-engineering to reduce time required on procurement activities • Provide more services and functionalities • Provide easier access to information and documents

		• Provide training and helpdesk services to stakeholders
External	Partnership	• Develop effective and efficient communication with partners • Focus on collaborative procurement services • Provide assistance to partners to resolve any issues during adoption • Provide training and expanded services to partners
	Public involvement	• Develop effective and efficient communication with partners • Gain trust and support from public in regard to system use • Provide open access to procurement information online
	Public awareness	• Develop effective and efficient communication with partners • Provide open access to procurement information online • Provide assistance and helpdesk services to the public

However, the taxonomy and controls proposed in this study are only representative of a small sample; they can be expanded in accordance with specific risks encountered during e-procurement adoption. Hence, they are not intended to be readily generalisable. This study has been developed based on an initial perception of risks. However, e-procurement continues to evolve rapidly, so too do the associated risks. Further study should be focused on prioritisation and quantification of risks, as well as their likelihood and practical impacts.

7.7 Implementing E-Procurement Critical Success Factors

Public organisations need to identify and understand the important factors that are crucial for successful delivery of e-procurement (Vaidya *et al.* 2006). By gaining understanding of such factors, public organisations will be able to organise themselves to better prepare their e-procurement plans and, thus, to secure the optimum benefits from the system and to avoid any possible failures. It is argued that it is impossible to assess the progress and performance of e-procurement without identification of critical success factors (CSFs). The identification of CSFs can

contribute to the development of a strategy to further enhance delivery of public e-procurement in developing countries.

7.7.1 Identification of Public E-Procurement CSFs

The analysis identifies a number of factors that contribute to the degree to which adoption is successful. They spring from three main sources: technological, environmental and organisational. The identified factors were apparent and recurrent throughout our analysis and this reflects their growing importance in defining best practices for the successful adoption of e-procurement. However, throughout the analysis it was suggested that the environmental factors were considered to have little influence on e-procurement adoption. One possible explanation for this is the lack of experience with e-procurement by this study's respondents. The following factors were identified as the major, perceived, critical success factors in the adoption of e-procurement by the public sector in Indonesia:

Technological advancement provides wider opportunities for organising successful e-procurement. This suggests that the degree of adoption can be influenced by the sufficiency of supporting technological infrastructure and system development. This analysis also posits that organisations with better investment in IT infrastructure have the best opportunity for successful adoption. Certainly, developing infrastructure for e-procurement demands the commitment of certain resources, including people, funds and equipment. Additionally, it is crucial to provide appropriate IT infrastructure to ensure compatibility and integration with existing technologies. In summary, the four key technological success factors of e-procurement are:

- Technology and system development
- System integration
- Security and authentication
- User-friendliness

In addition to the technological factors, it is also acknowledged that organisational factors affect the success of e-procurement. It is argued that e-procurement has

changed how organisations operate; it requires re-engineering of procurement processes and sometimes structural adjustments (Farzin and Nezhad, 2010). Another organisational perspective is considered to deal with human resource qualities and the amount of resources available. Developing human resources, thus, is vital to enable technology to pave the way for the extra benefits and value creation that is possible.

7.7.2 Benchmarking of Public E-Procurement

It also was suggested that the identified factors can be used as a benchmark to monitor the e-procurement adoption process. In order to perform effective benchmarking, the establishment of benchmark metrics is required to enable performance measures that can result in improvements in e-procurement adoption (Love and Smith, 2003). A contribution of this research, through the establishment of benchmarks for e-procurement success factors, could be its use by public organisations to compare their performances against best practice. Benchmarking of defined criteria for successful e-procurement adoption are presented in Table 7.4.

Table 7.4 Defined Criteria for Successful E-Procurement Adoption

Classification	**CSFs**	**Defined Criteria**
Technological	Investment in infrastructure	• Full adoption of e-procurement system • Process re-engineering in place • Adequate infrastructure to support the system
	Technology and system development	• Standard procedures and processes for e-procurement • Regular updates for system upgrading • Standard technological specifications (hardware and software)
	System integration	• Integration with other relevant systems (internal and external)
	Security and authentication	• Platform for data security and authentication • Standard procedures and processes for e-procurement • Quality of the system (reliability and adaptability)
	User-friendliness	• Extent of use/number of transactions • Level of user satisfaction • Availability of supporting services/helpdesk
Organisational	Organisational resources	• Development of appropriate organisational structure • Effective communication • Automation of authorisation workflow
	Human resources development	• Provision of regular training • Availability of personnel to perform procurement • Qualification requirements for tender performance
	Commitment and support from top management	• Availability of financial resources • Amendment of legislation governing e-procurement • Establishment of strategic alliances with partners

7.8 The Need for a Focus on Quality

This study suggests that the delivery of excellent, high quality services in e-procurement is critical in supporting the benefits realisation of e-procurement. This mirrors statements by Vaidya *et al.* (2004), who mentioned that there had been demand for measuring the performance and quality of e-procurement adoption. Notably, the analysis of this current research reveals that the quality of e-procurement contributes significantly to its impact on performance and satisfaction, which leads to e-procurement compliance.

This study extracts the E-Procurement Quality (EPQ) dimensions from six determinants: Professionalism, Processing, Training, Specification, Content and Usability. By paying adequate attention to these determinants, public organisations can improve the quality of their services, which, in turn, will support the successful adoption of e-procurement. The determinants can be used as a mechanism for the prevention of poor quality service. Therefore, public entities should give greater attention to the following most relevant EPQ scale factors, which include:

- Professionalism: this concerns the skills, knowledge and experience required to provide ongoing support to users of e-procurement systems and is concerned not only with technical expertise but also with the attitudes of users. The analysis identified that support availability, reliability, and responsiveness were found to be significant components that have the potential to influence the extent of user compliance. Typically, support should be available when encountering any queries or problems with the e-procurement system. Therefore, an organisation is challenged to provide resources and the flexibility to support its users sufficiently. In addition, any queries or problems should be solved immediately; however, when responses are delayed, support should indicate arrangements for a later solution. It was also highlighted that punctual service delivery leads to satisfaction.
- Processing: this study's analysis acknowledged the impact of e-procurement on order cycle-time (time taken from sourcing a good/service to its delivery). The timeline for supply of goods and services was found to be crucial for delivering service quality and meeting the compliance requirements of the system. The

analysis suggests that the most significant issues of processing accrue from the speed, complexity and accuracy of processing orders. There is a high demand to focus on the ability to control order cycle-time. This suggests that the user's intention to use the system is strongly influenced by the time required for an order to be processed. Moreover, the analysis exhibits that effective processing capability impacts positively on user satisfaction and increases the extent of e-procurement adoption. System compliance and satisfaction also can be met by enabling a high level of order accuracy. An e-procurement system ensures that the right goods or services are delivered correctly, as ordered, particularly through accurately updating the data on a timely basis and reducing data re-entry during the process.

- Content: e-procurement content entails what is loaded into the system and how easy it is to find within the system. The content dimension concerns the accuracy, conciseness and timeliness of information. The analysis suggests that an e-procurement system must be able to provide access to content by its users and must consider the appropriateness of the content loaded into the system, including the suppliers and catalogues. Thus, it is crucial to provide easy search options for suppliers or catalogues.

7.9 Operationalisation of the E-Procurement Adoption Evaluation Model

Previous sections have described the model for evaluating e-procurement adoption within the context of the public sector, and have proposed the metrics for practical operationalisation of the determinants for e-procurement benefits, risks, costs, success factors and quality. A method has been developed to operationalise the public e-procurement evaluation model proposed in this research, as presented in Figure 7.2. The elements of Benefits Realisation Management (BRM), Risks Management, Cost Management and Performance Management (Critical Success Factors) have been drawn together to support the model. In developing the strategy for operationalisation of the model, it is important to explore the elements/factors of each variable in the model using particular metrics. The examples of the metrics and the correlating factors for each element have been discussed in the previous subsections (see Table 7.1, 7.2, 7.3 and 7.4).

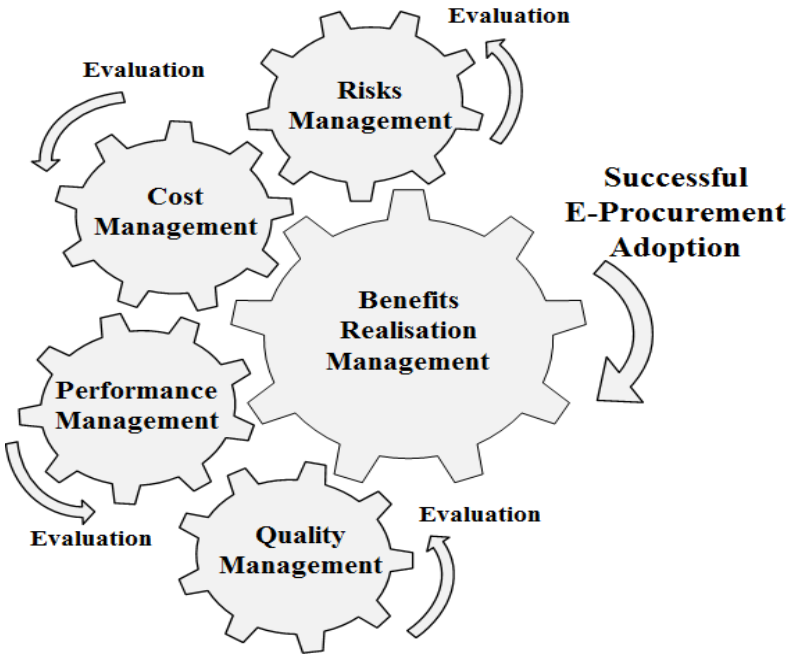

Figure 7.2 Method for Operationalisation of the Model

There are numerous ways for public organisations to put this evaluation model into practice. The method has been created as a business plan and a means to practically measure the performance of the evaluation model proposed by this study. Its high level of replicability and flexibility adapts to the scale of each organisation's procurement activities and its potential impacts. Thus, the proposed method arguably contributes in different ways to the applicability of the evaluation model.

In addition, adopting e-procurement entails changes that place significant demands upon the organisation to adapt to the impacts of those changes and to manage them in order to reap the full benefits of the system (Yu *et al.*, 2015). As Wu *et al.* (2007) found, the development of a management change plan, as well as its associated learning components, is an important antecedent of e-procurement. The next section discusses change management and organisational learning necessary for the successful delivery of e-procurement.

7.10 Change Management for E-Procurement Adoption

Successful adoption of e-procurement in a public organisation requires significant changes to the way that organisation performs its procurement processes. This

analysis asserts that transferring procurement to electronic means places significant demands on an organisation to make changes in the three main aspects of its technology, processes and people. The automation of procurement practices requires technological changes that also call for technological capabilities and readiness in order to support effective deployment. Adopting e-procurement also induces changes in the processes themselves that institutionalise e-procurement within the organisation's culture and values. Accordingly, the organisation must support new learning processes in regard to the new system, as well as establishing the appropriate structure and supportive culture in accepting e-procurement (Soares-Aguiar and Palma-dos-Reis, 2008; Wirtz *et al.,* 2009; Yu *et al*., 2015).

However, such required changes in adopting e-procurement are likely to face some form of resistance that hinders the adoption (Vaidya *et al.*, 2006; Siita, 2014; Bakland and Kilvik, 2015; Suliantoro *et al*., 2015). Changes in technology will incur adjustment costs for the organisation in providing the system and technological infrastructure; the people must be prepared to accept and to use the system, and changes may even be necessary in the structure to support the system. More importantly, Neef (2001) suggests resistance from the people as the primary impediment to e-procurement adoption. This includes the fear of a heavy workload, uncertainty about the system, and the possibilities of redundancy and lost power as results of the adoption (Suliantoro *et al*., 2015). Thus, there have been significant demands placed on organisations to overcome the resistance to change by aligning the three aspects of technology, processes and people into a change management strategy. This suggests that a lack of change management plan may lead to the holding back of acceptance of any e-procurement initiative (Vaidya *et al.,* 2006; Bakland and Kilvik, 2015).

Yet it must be borne in mind that adopting e-procurement is not the final stage of the initiative; it is part of an ongoing process that requires change management and evaluation to consider the many key aspects of e-procurement in combination. Technology alone is insufficient to ensure the benefits realisation of e-procurement; a plan for change management must be developed to enable an organisation to improve its performance and to deliver successful adoption (Akibate, 2015; Imamoglu and

Rehan, 2015; Yu *et al*., 2015). This study also suggests that a change management plan must be positioned as the core aspect of e-procurement adoption in order to provide the base knowledge that will support a greater extent of adoption. In respect of change management realisation, a different level of engagement is required: in particular, visionary leadership is needed to elicit support and commitment across the organisation for streamlining procurement processes; changes must be embedded into the organisation's values and culture; adequate resources, infrastructure, technology and training must be provided; reorganisation of the structure is required; and an environment for learning must be created. This suggests that the key to successful change management is a focus on development of a knowledge base for adopting the system through organisational learning.

7.11 Organisational Learning

Public e-procurement can be viewed as the attempt of government to modernise its procurement activities. However, e-procurement adoption initiatives are subject to various and unexpected changes that differ from case to case and evolve over time (Hardy and Williams, 2008). It has been suggested that public organisations need to be able not only to perform the evaluation of e-the procurement process but also to extract the learning and knowledge to be obtained from adoption (Yu *et al.*, 2015). As Gunasekaran *et al.* (2009) and Li *et al.* (2015) highlighted the importance of e-procurement knowledge and learning, similarly, this study also suggests that organisational learning is essential for successful e-procurement adoption, particularly within the public sector.

Organisational learning can be viewed as the ability of the organisation to improve its activities to deliver a successful project (Wu *et al.*, 2007). In the context of public e-procurement, organisational learning refers to the process by which an organisation learns and improves its procurement activities. It also means that the knowledge of e-procurement adoption needs to be institutionalised within organisational routines, workplace culture and work processes. Further, Wu *et al.* (2007) and Yu *et al.* (2015) described an organisation's learning ability as the antecedent for e-procurement success. An organisation that is able to assimilate and apply e-procurement

knowledge has a greater opportunity to be more successful in adopting e-procurement (Hassan, 2013). Despite this, organisational learning remains relatively unstudied, particularly in the field of public e-procurement (Salonen, 2015). Nonetheless, organisational learning is suggested to play an important role in the successful delivery of public e-procurement. Thus, this study also attempts to identify the organisational learning elements associated with public e-procurement adoption.

Reflected in the findings of case studies, the interviews indicate the need for organisations to learn from success and failure on e-procurement adoption and improving their performance even further (see Table 5.15). While there was evidence of learning, a formal framework for organisational learning is lacking within the case organisations. However, this research also able to conceptualise how public organisations learn from past experiences and apply knowledge for success adoption with the focus on people, organisation, technology and knowledge aspects relate to e-procurement adoption in public sector. As an example for an organisational learning concepts and practices, Table 7.5 shows the description of each element and the proposed lesson learned practices for successful public e-procurement adoption.

7.11.1 People Aspects of Organisational Learning

The people context concerns both individual and team learning. The adoption of e-procurement by public organisations also has the potential to change the way people work by replacing all manual procurement procedures with an electronic platform. The readiness of the people to change and to learn within the organisation is, therefore, crucial to the success of adoption. Similar to the conclusions of Soares and Palma-dos-Reis (2008), the study findings indicate that the adoption of e-procurement is affected by the knowledge and skills of employees and stakeholders. In this context, learning refers to the collective learning of all individuals that interact simultaneously within the organisation.

The learning starts from the individual's intuition and interpretation of e-procurement adoption, resulting in the modification of individual skills and

behaviour (Rahim, 2008). This is followed by integration of that learning at a group level, which finally reaches a stage at which the knowledge becomes institutionalised and regularised at the organisational level. The higher extent of e-procurement knowledge enables organisations to learn from their successes and failures, as well as being aware of the associated elements of adoption that include the costs, benefits, risks, success factors and quality. The opportunity for improving the e-procurement adoption process can be greater when a solution is deployed organisation-wide and is widely accepted by the people within the organisation (Salonen, 2015; Suliantoro *et al.* 2015).

However, this study also found that minor resistance arises among individuals. For instance, the procurement staff and the contractors/vendors may be against the changes associated with e-procurement adoption (see Table 5.11). This includes the fear of being replaced by the technology and the fear of a bigger workload. Despite this, it is suggested that regular and extensive training on e-procurement adoption is crucial to support individuals and teams, as well as to provide learning environments within public organisations. In addition, mentoring and knowledge-sharing between individuals are helpful methods to overcome barriers to acquiring new knowledge about e-procurement. Communicating the significance of the system in such way may lower the potential for resistance (Kivlik and Bakland, 2015).

7.11.2 Organisational Aspects of Organisational Learning

Organisational elements, such as the social, cultural and structural features of an organisation, as well as its leadership, are important for the successful dissemination of learning about e-procurement adoption (Reunis *et al.*, 2004; Hanna *et al*., 2010; Duffield and Whitty, 2015). The social context of learning is the process of learning and acquiring knowledge through social interactions among the individuals and groups within the organisation. It is highlighted that the organisational knowledge associated with e-procurement adoption can be developed when individuals share the information and knowledge through socialisation. This is then followed by externalisation and institutionalisation of the knowledge as part of the organisation's culture. For a public organisation to develop its learning capacity, it is suggested to

focus on the establishment of that organisation's culture to encourage its employees to learn and be creative in their adoption of the e-procurement system (Suliantoro *et al.*, 2015). As noted from the study findings, it is recognised that e-procurement has become institutionalised and regularised as a part of public organisational culture in Indonesia. Thus, the technology itself will not be guaranteed to bear the fruit of e-procurement adoption unless a supportive culture and accommodating social attitudes are in place. Reinforcing the literature (Gunasekaran *et al.*, 2009; Hassan 2013), it also has been highlighted that successful e-procurement uptake requires attitude changes towards e-procurement by the individuals within an organisation.

In contrast, both the cultural and social factors can inhibit learning within an organisation. The transition of public procurement to an electronic platform, inevitably, requires significant changes from the people as well the way public organisations deal with stakeholders, which also are subject to some form of resistance. An obvious challenge for a public organisation is how to overcome the cultural inertia associated with e-procurement adoption. Organisations should provide a supportive social and cultural environment for learning, in conjunction with appropriate structures, systems and procedures necessary to support e-procurement learning. Organisational structures in the public sector need to be redesigned to accommodate learning in regard to e-procurement adoption. This also includes redefining the roles, responsibilities and procedures that support e-procurement (Yu *et al.*, 2015).

It is suggested that e-procurement adoption, by its nature, has the potential to transform public organisational structure because it promotes decentralisation of procurement activities into an electronic system that is accessible anytime and anywhere. As Wu *et al.* (2007) assert, an organisation is likely to succeed in adopting e-procurement when the dissemination of information, effective communication and coordination across the organisation become part of the mainstream operations of that organisation (see Table 5.15). However, adopting e-procurement on behalf of the public is even more challenging because it entails complex social interactions among individuals within the organisation as well as the joint development of structures, procedures and systems (Reunis *et al.*, 2004, Teo *et al.,* 2009) that call for

restructuring and realignment of processes within the organisation. This suggests that a lean structure is crucial to provide a greater level of communication and to support the decision–making process.

Furthermore, the people context of learning is associated with leadership because it is a key factor encouraging e-procurement adoption (MacManus, 2012; Nurmandi and Kim, 2015). Support and commitment from the top managerial level is a crucial factor in institutionalising e-procurement within the public sector (Wahid, 2012). Leadership can be one of the enablers for e-procurement organisational learning through the allocation of sufficient resources, dealing effectively with technological and organisational constraints, and management of the people within the organisation. However, it also can be a barrier when there is a lack of commitment from top level managers and decision–makers, particularly when due to a lack of knowledge and training as well as resistance to any changes that will result from e-procurement adoption (Akibate, 2014; Suliantoro *et al.,* 2015). Thus, the opportunity for improving the e-procurement adoption process and reaping the maximum benefits of its adoption can be greater when learning about the system's use is established upon the organisation's social, cultural, structural and leadership features, alongside the technological aspects.

7.11.3 Technological Aspects of Organisational Learning

The adoption of e-procurement should be driven by both technology and procurement processes (Neef, 2001; Fernandes and Vieira, 2015; Khorana *et al.,* 2015). There are claims that advocate the use of information technology as an enabler of organisational learning (Robey *et al.*, 2000; Ruiz-Mercader *et al.*, 2006; Fang, Li and Lu, 2016). While organisational learning makes it easier to adopt technology, an organisation that focuses on investing in information technology and developing its people will contribute positively to the success of its organisational learning that, in turn, will improve the organisation's capabilities and performance in handling changes (see Table 5.15). Likewise, this study suggests that adequate technological infrastructure supports both individual and organisational learning and the acquisition of knowledge associated with e-procurement adoption. In addition,

regular updating and upgrading of the technology is crucial to ensure that the most appropriate technology is available (Wu *et al.*, 2007; Duffield and Whitty, 2015). However, technology is not a silver bullet. As technology deployment entails more complex tasks, there is a rising demand for expertise and communication skills within organisations (Panda and Sahu, 2012; Kivlik and Bakland, 2015). Thus, finding a balance between the technological and human aspects is crucial to deliver successful e-procurement adoption.

7.11.4 Knowledge Aspects of Organisational Learning

Knowledge is an important ingredient for every organisation. The knowledge is developed and absorbed by individuals, shared with the group, then institutionalised as part of the organisation's system, processes and culture. Knowledge management is complemented and embraced by a supportive environment, adequate technology and re-engineering of processes to accelerate organisational learning. It is acknowledged from the results of the analysis that public e-procurement needs to be armed with knowledge and skills to deliver the expected benefits from its adoption. Likewise, other studies of e-procurement have asserted that knowledge of the systems involved has a significant impact upon the performance, and the extent, of e-procurement adoption (Gunasekaran and Ngai, 2008; Bahaddad *et al.,* 2015; Bof and Casella, 2015). Conversely, a lack of e-procurement knowledge and skills can further hinder adoption of the system (Gunasekaran and Ngai, 2008; Eadie *et al.,* 2012; Khorana *et al.*, 2015; Ronald and Omwenga, 2015). E-procurement adoption also involves changes in the processes of procurement that call for their re-engineering and subsequent modifications in employee behaviour to focus on continuous quality improvements (Khanapuri *et al.* 2011; Panda and Sahu, 2012; Siita, 2014; Kivlik and Bakland, 2015).

As an example of organisational learning concepts and practices, Table 7.5 describes each element and the proposed lessons to be learned, derived from the practices of the five case studies, for successful public e-procurement adoption.

Table 7.5 Summary of Organisational Learning Concepts and Practices

Learning Elements	**Learning Attributes**	**Practices**
People	• Individual learning • Team learning	• Training and education • Mentoring • Sharing knowledge
Organisation	• Culture • Social interaction • Structure • Leadership	• Collaborative work • Effective communication • Appropriate structure • Systematic procedure • Top management support
Technology	System technology	• Adequate IT infrastructure • Regular technology updates and upgrades
Knowledge	• Process • Knowledge management • Continuous improvement	• Process re-engineering • Knowledge management framework • Focus on quality management

An attempt has been made to define a strategy for change management to support organisational learning in regard to e-procurement adoption, as presented in Figure 7.3. Thus, the concept of organisational learning for e-procurement adoption can provide the organisation with an approach towards any changes that must be made within the surrounding environment. Organisational learning, moreover, is an on-going learning process that also includes a feedback loop to provide information for future improvement (Love, 2001; Hanna *et al*., 2010). However, this framework for organisational learning is generic and can be applied by any public organisation in a variety of circumstances to consider the nature of the changes, the way those changes are managed and the pre-requisites for the organisation to be adaptable in making the changes.

This suggests the important role of the top level managers in assessing the knowledge base and building a capability for ongoing change in relation to e-procurement (Wahid, 2012; Hassan, 2013; Nurmandi and Kim, 2015). In addition, a continuous loop learning strategy that entails the review and evaluation of current organisational practices, values and assumptions would be advantageous in improving organisational adaptability in regard to e-procurement. If learning

becomes a driving force and part of the culture in public e-procurement, it will create more awareness and will improve the extent of its adoption, which is crucial for the project's success (Wu *et al.*, 2007; Hassan, 2013; Yu *et al.*, 2015).

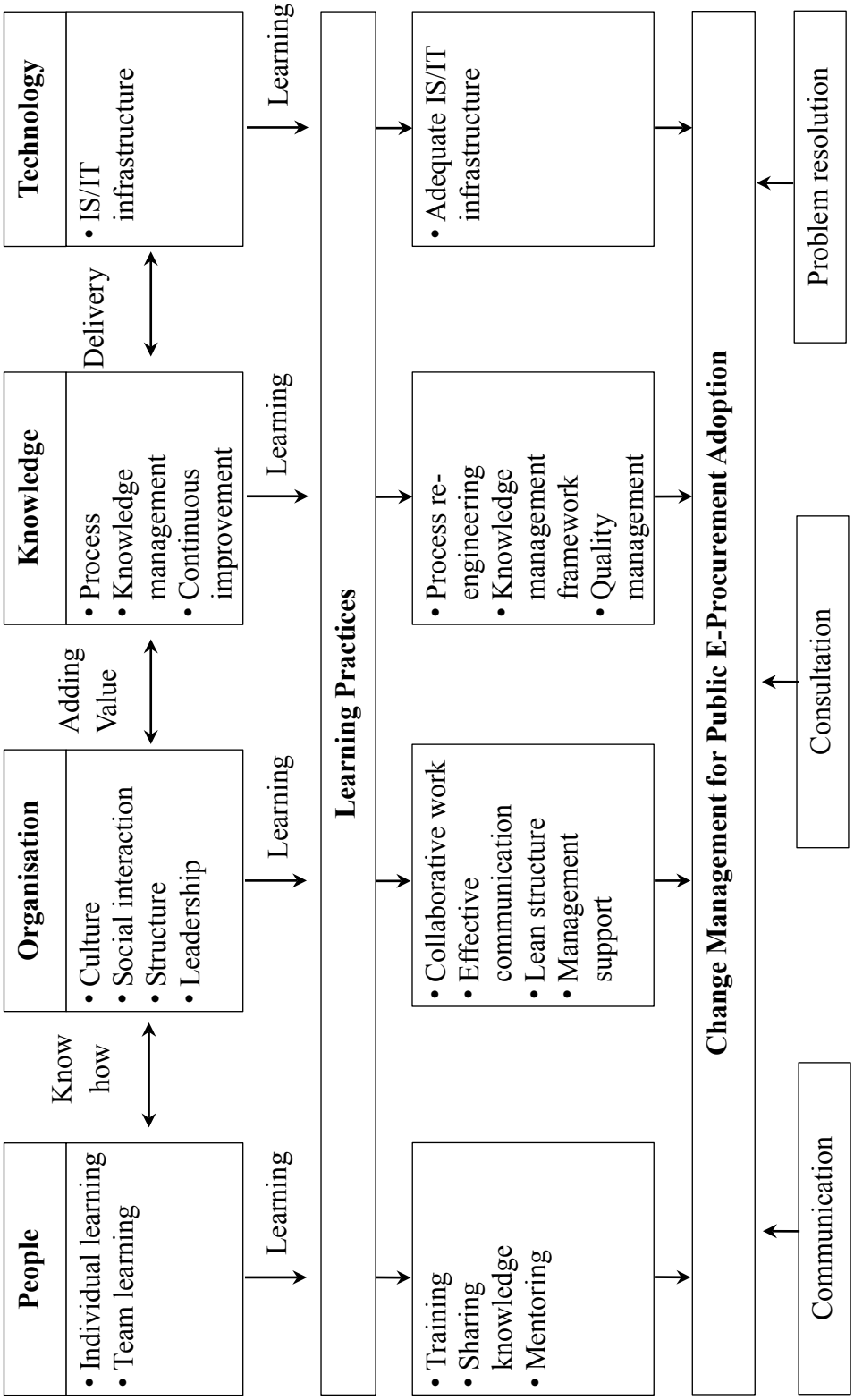

Figure 7.3 Change Management and Organisational Learning for Public E-Procurement Adoption

7.12 Chapter Summary

There is a need to provide suitable assessment and evaluation of public e-procurement adoption in order to obtain the full benefits from this initiative. This chapter has discussed the final *ex-ante* model for evaluation of public e-procurement and explained how this model will benefit its successful adoption. It is suggested that a number of key determinants of e-procurement may be potential hurdles for its successful adoption within the public sector context, those being the costs, benefits, risks, success factors and quality. In addition, the research found that alignment of the evaluation of e-procurement with benefits realisation management is crucial to determine whether the benefits from e-procurement adoption are eventually realised and delivered. In a similar way, the management of costs, risks, success factors and quality of e-procurement are essential to ensure its successful adoption.

As a contribution to the body of knowledge, this study has developed a series of metrics that can be used as the strategy to operationalise the evaluation model in practice. In addition, there have been calls for public organisations to focus on change management to support organisational learning. While an organisation's learning ability is acknowledged as one of the antecedents for e-procurement success, this study also has identified the need to establish a change management strategy to overcome any difficulties brought about by changes that are the result of e-procurement adoption. Attempts have been made to integrate the change management strategy with the elements of organisational learning that contribute to successful e-procurement adoption, through embracing the aspects of people, organisation, knowledge and technology. This will enable a greater degree of adoption and, thus, will contribute to the development of a knowledge base for e-procurement through learning.

The next chapter provides a summary of the research and the implications of its findings, as well as recommendations for future research on the evaluation of e-procurement adoption.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

E-procurement has transformed the way in which organisations perform their procurement activities. Its adoption provides a wide range of benefits to be acquired at the strategic, operational and tactical levels of an organisation. The adoption of e-procurement by the public sector, however, is a complex, costly and time-consuming task, with many organisations struggling to deliver the expected benefits that can potentially be provided. To ensure the realisation of benefits, a robust evaluation process of the issues influencing the adoption of e-procurement is required.

Bearing this in mind, the research presented in this thesis aimed to develop an evaluation model that would ensure the successful adoption of e-procurement by the Indonesian public sector. The first objective of the research was addressed; the cornerstones of e-procurement adoption were identified from the normative literature, and were found to be: (1) benefits, (2) costs, (3) risks, (4) critical success factors and (5) quality of e-procurement. To address the research aim, triangulation was implemented, which comprised of case studies and a survey questionnaire. Five detailed case studies were undertaken to obtain insight regarding current e-procurement adoption at a greater depth, and to provide the theoretical base for the design of the questionnaire.

The analysis of the findings led to the development of an e-procurement evaluation model that is theoretically and empirically satisfied the second and the third objectives of the research. While the model has its merits, it has yet to be validated in practice. Thus, it is suggested that future research should be undertaken to accommodate the specific decision-making nuances of various government departments within Indonesia. Recommendations and directions for future research in this fertile and important area also are proposed.

8.2 Evaluation of Public E-Procurement Adoption

This research set out to identify the determinants for (1) benefits, (2) costs, (3) risks, (4) critical success factors and (5) quality, which were subsequently used to develop a model for evaluating e-procurement adoption. This is the first development of a comprehensive model that embraces all five of these determinants to evaluate e-procurement adoption. The model was developed with a particular focus on the Indonesian public sector and, therefore, should assist organisations within this sector in delivering maximum benefits and ensuring 'business value' from e-procurement adoption.

The initial review of literature reinforced the importance of the relationship between IS/IT evaluation and the realisation of benefits when adopting e-procurement systems. However, the evaluation of e-procurement systems, particularly within the public sector context, has received limited attention to date. Previous studies had not framed the evaluation collectively using multi-dimensional determinants. While it was recognised that the five determinants of e-procurement needed to be combined into an *ex-ante* evaluation model, it was also noted that evaluating e-procurement is a challenging proposition that is affected by a number of inter-related factors.

Notably, a key determinant that contributes to successful e-procurement adoption is system quality. Thus, there is also a need for measuring and evaluating the performance and quality of e-procurement systems. In order to ensure the model coverage was comprehensive, e-procurement quality measures were identified and incorporated into the proposed model alongside the benefits, costs, risks and critical success determinants. The proposed e-procurement model was subsequently tested and evaluated within the Indonesian public sector.

8.3 Collection of Data

Chapter 4 outlined the justification for the research methodology adopted in this study. Notably, several studies on e-procurement have advocated the use of triangulation in data collection in order to provide deeper insights. For this study, the

triangulation process started with case studies and continued with a subsequent survey questionnaire. A qualitative approach was adopted in the first phase, through 34 semi-structured interviews that formed five case studies. The interviews were used to collect the primary data and were complemented by documentary sources that were elicited from both within and outside the organisations to obtain deeper understanding of the evaluation of e-procurement adoption. In addition, the selected case studies and the data collection strategy were described; the trustworthiness of the data, the employment of both 'within-case' and 'cross-case' analysis, as well as the limitations of the case studies were presented.

The second phase adopted a quantitative approach through the development and design of a questionnaire. The sample population, methods of data analysis, reliability and validity of the research instrument and the limitations of the questionnaire were each presented. In order to test the results of both the qualitative and quantitative data, Structural Equation Modelling (SEM), using Confirmatory Factor Analysis (CFA), was selected for the analysis of the developed model and hypotheses.

8.4 Key Determinants for Evaluating Public E-Procurement Adoption

Chapter 5 discussed the analysis of data derived from the five case studies concerning public sector e-procurement adoption. The data obtained from interviews, as the main source, was supplemented by relevant documents provided by the case organisations, and all data was further analysed using 'within-case' analysis for each case. This was followed by a synthesis of the findings from the five cases using 'cross-case' analysis. The documentary sources, obtained from within the organisations, provided insight to the organisations' backgrounds as well as the adoption process and its current progress. To assist the analysis, the NVivo qualitative data analysis software package was utilised to manage the data. The results were used to identify and to confirm the determinants of the five cornerstones, (i.e. benefits, costs, risks, success factors and quality) and to refine the model initially proposed through the literature review.

The conceptual models derived from the literature and the qualitative data analysis were discussed and compared. There were no major differences identified between the cases and the literature, with both confirming the significance of the determinants of the five identified cornerstones. However, some small nuances in terminology were identified and, based on these findings, the model was updated to be used as the foundation for the formulation of hypotheses and development of the questionnaire.

The results of the questionnaire were presented in Chapter 6, which sought to verify the determinants of the costs, benefits, risks, success factors and quality of e-procurement adoption. Three steps of analysis were employed to empirically test the data obtained from the survey questionnaire: preliminary analysis, SEM using CFA, and hypothesis testing. It was reported from the preliminary analysis that the data met the basic assumptions for using SEM, including testing for missing data, detection of outliers, non-response bias, and confirmation of normality of data.

The testing of the model with SEM, using CFA, resulted in model refinement in order to achieve model fit. Some variables were found to be insignificant and were therefore excluded from the model. Initially, the model consisted of 89 observable variables and 16 unobserved variables. After modification, the final structural model was simplified, with 49 observed variables and 13 unobserved variables relating to the five cornerstones. It was confirmed that the structural model was a fit with the observed data, despite the simplification resulting from the removal of non-significant variables, and so it was further utilised to confirm the hypotheses. In the hypothesis testing, the analysis showed that all nine proposed hypotheses were confirmed, with demonstration of significant coefficients of paths and in the hypothesised direction. In other words, the model in this research is a promising tool for evaluation of e-procurement adoption.

8.5 Model for Evaluation of Successful E-Procurement Adoption

In Chapter 7, the final evaluation model for successful public e-procurement adoption was discussed. Notably, the results reinforced the assumption that the determinants of the five key aspects of costs, benefits, risks, success factors and

quality are crucial when evaluating e-procurement adoption. However, the final evaluation model indicated minor differences between it and the conceptual model due to the nature of the analysis undertaken and the extent of exposure to the systems experienced by organisations during adoption. The final model is seen as an approach for improving the evaluation of e-procurement adoption, particularly in the public sector.

Results throughout the study have indicated the importance of *ex-ante* evaluation to complement such a model. A contribution to the knowledge in the form of the operationalisation of the model is therefore proposed within the context of a Benefits Realisation Management (BRM) framework. This includes the development of metrics that can be used as the strategy to operationalise the evaluation model in practice. In the context of BRM, this study used three steps to perform benefits realisation and management. The benefits were initially identified and classified into strategic, operational and tactical benefits. These benefits were subsequently measured and monitored, then finally incorporated into the metrics of a BRM strategy as part of an organisation's business case. Key Performance Indicators (KPIs) were developed as a measurement baseline, and to be used for review throughout the e-procurement adoption lifecycle. These can be used to assist organisational learning and to provide support with the change management associated with adopting new systems.

In order to ensure that the benefits of adoption are realised, a better understanding of the management of indirect costs, as well as direct investment costs, is required. The findings indicated that there are three major sources of cost associated with e-procurement adoption, those being technological, organisational and environmental costs. Within each group there are both indirect and direct costs that need to be managed. In addition, identification and management of the risks of adoption emerged as being crucial for successful management of both costs and benefits realisation. As the adoption of e-procurement continues to evolve rapidly, so too do the associated risks. Thus, continuous monitoring, which includes prioritisation and quantification as well as risk likelihood and impact, is required.

Importantly, the early identification of the factors that are critical for successful e-procurement adoption (CSFs) can provide a mechanism for assessing the progress and performance of an e-procurement initiative. It is widely recognised that CSFs are 'best practice' when used by an organisation as the baseline for assessing the progress and performance of e-procurement adoption. In addition to CSFs, there has been increasing importance placed on assessing the quality of e-procurement services, since quality of service is a key determinant for system performance and user compliance. This study identified six quality determinants that impact on system performance: namely, professionalism, processing, training, specification, content and usability of the e-procurement system.

In order for the Indonesian public sector to successfully move to a new way of working, which is implicit in the adoption of an e-procurement system, it is suggested that there is a substantial requirement for change management to support the required organisational learning, with an emphasis on people, organisation, knowledge and technological aspects of e-procurement adoption within the Indonesian context. With regard to people, it can be seen that learning starts with the individual before integrating that learning into the group level and finally institutionalising the knowledge at the organisational level. To develop learning capacity, an organisation needs to focus on the establishment of its culture and social interactions, as well as the adoption of an appropriate structure with visionary leadership. This needs to be balanced with adequate technological infrastructure that is capable of supporting the organisational learning and acquisition of knowledge associated with e-procurement adoption. This will enable a greater degree of adoption and, thus, contribute to the development of a knowledge base for e-procurement through learning.

Notably, the concept of organisational learning for e-procurement adoption can provide a public organisation with the strategy for dealing with any changes in the surrounding environment. More importantly, it is suggested that support from the top managerial level is needed to assess the knowledge base and to build ongoing change capabilities towards successful adoption of e-procurement. Once learning becomes a culture and a driving force in public e-procurement adoption, it creates awareness

and improves the extent of adoption, both of which are crucial for a project's success. Based upon the discussion of the findings, a generic practical strategy for change management was developed that utilises the significant contributory value of organisational learning upon the successful adoption of e-procurement.

8.6 Recommendations from the Research

The research has important implications, both theoretically and practically, for the evaluation of e-procurement adoption, particularly within the Indonesian public sector context. This study enhances the theoretical ideas of e-procurement evaluation by providing empirical evidence derived from relevant cases drawn from the Indonesian public sector, and it provides a comprehensive model for evaluating such e-procurement adoption. To date, evaluation of e-procurement, particularly in the public sector, has not been widely performed. In addition, a number of valuable lessons learned from the research findings have been presented, which organisations could address when aiming to deliver successful e-procurement adoption:

- The need for organisations in the Indonesian public sector to develop a strategy for benefits realisation and management to ensure successful delivery of e-procurement adoption has been demonstrated. This strategy can be used as a guide to adoption through measuring and tracking benefits and by incorporating the strategy into an organisation's business case. Practically, it can be performed by developing the Key Performance Indicators (KPIs) and the measurement baseline as applied metrics to be monitored throughout the e-procurement adoption lifecycle. This should be accompanied by a review of the benefits to enable organisational learning, as well as to provide the necessary updates to the business case;
- The costs associated with e-procurement adoption need be taken into consideration to support benefits realisation and to provide a better understanding of the adoption process throughout its lifecycle. The study suggests that the common patterns of e-procurement costs can be classified into those associated with technology, organisation and environment and should take account of both direct and indirect costs. This must be accompanied by monitoring and control of

those costs by assessing the related factors;

- Of particular note, the research recommends the examination and re-examination of the risks encountered during adoption, along with the controls that can be utilised to develop management strategies. The controls provide the measures to manage, mitigate and eliminate any risks that occur and they can be in the form of a procedure, system, process or device, depending on the level of risk;
- There is a need for public organisations in Indonesia to assess the progress and performance of e-procurement through the identification of Critical Success Factors (CSFs) for successful e-procurement adoption. The study identifies three main sources of such factors that contribute to the degree of success of adoption: technological, environmental and organisational. The development of CSF benchmark metrics can be beneficial for comparing an organisation's performance against best practice;
- Organisations should give greater attention to the quality of e-procurement because it contributes to performance improvement and user satisfaction, which ultimately leads to user compliance and adoption success. This includes the assessment of six dimensions of E-Procurement Quality (EPQ): namely, professionalism, processing, training, specification, content and usability;
- There is a recommendation that public organisations should focus on change management to support their organisational learning. While the organisation's learning ability is acknowledged as the antecedent for e-procurement success, it is equally important to establish a change management strategy that focuses on the human, organisational, knowledge and technological aspects of e-procurement adoption.

Especially, it is recommended that organisations should devote serious attention to the concept and the model that have been presented and discussed in order to deliver successful evaluation of e-procurement adoption. The research does not aim to tell governments how they should evaluate their e-procurement initiatives, but to suggest what they might do to ensure the delivery of successful benefits from e-procurement adoption.

8.7 Recommendations for Future Research

Prior to this research, there were limited studies on e-procurement adoption, particularly within the context of the public sector. There has been no generally accepted conceptualisation of e-procurement evaluation. Furthermore, the scope of previous studies has been inadequate, with some significant variables relating to costs, benefits, risks, success factors and quality of e-procurement not being taken into account. This research contributes to the body of knowledge through providing a comprehensive model to evaluate e-procurement systems with consideration not only of the benefits but also of the other key determinants of costs, risks, success factors and quality of e-procurement systems. While being developed for the public sector, the model is generic in nature and can be applied under other circumstances, with appropriate adjustments being made.

There are also opportunities for promising future research in e-procurement evaluation through replication of the research methodology adopted for this study. In particular, the use of triangulation has been an effective strategy to examine e-procurement adoption from different perspectives, which in turn provides a deeper understanding of the issue. Indeed, the effectiveness and the limitations of the proposed evaluation model can only be measured through its implementation. Furthermore, studies similar in nature to this research can be performed within the confines of different areas and jurisdictions, to explore the applicability and the impact of this research within diverse societies and cultures. This study was performed within the context of the Indonesian public sector. Future studies can be performed in both public and private sectors, worldwide, using the model proposed in this research.

This study should provide further insights into the evaluation of e-procurement adoption and help public sector managers to manage their e-procurement initiatives. However, it should be noted that the evaluation model proposed is not a magic bullet. Instead, it is a tool that can be used by organisations as a guideline as well as a benchmark to pave the way for successful adoption. The research presented also has raised numerous issues that are worthy of further investigation. They include:

- It would be desirable to apply different measures and scales to the underlying constructs. For instance, it would be interesting to use the scale derived from practice on the private sector;
- The replication of this research in the future, using samples from different sectors and/or cultures could be important in attempting to confirm the conclusions of the findings.

Finally, the recommendations presented in this thesis provide some basis for further contributions to be made to the existing body of knowledge. More importantly, it provides valuable insights and findings that may be analysed and expanded by researchers in the future and, thereby, will enable organisations to evaluate their e-procurement adoption successfully.

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APPENDIX A

E-procurement Definitions from the Literature

Reference	E-Procurement Definition
Van Weele, 1994	The use of internet technology in the process of providing goods and services
Alaniz and Roberts, 1999	Internet solution that facilitates firms in their purchasing activities
OGO, 1999	The use of electronic technologies and applications to streamline and enable the procurement activities of an organisation
Gershon, 1999	The whole process of acquisition from third parties over the internet
Gebauer and Schad, 1999	The automation of a procurement system using the internet and related technologies
Morris *et al*., 2000	Series of steps of implementation of an internet-based system
Attaran, 2001	The integration of web-based procurement technology into an organisation's application system
Carabello, 2001	A technology designed to facilitate the acquisition of goods by a commercial or a government organisation over the internet
Essig and Arnold, 2001	The use of technology to substitute or enhance transactional activities in order to gain operating efficiencies
De Boer *et al.*, 2001	All forms of use of internet technology and electronic infrastructure that connects two organisations in the purchasing process
Laub, 2001	The value-added application of e-commerce solutions to facilitate, integrate and streamline the entire procurement

	process from initial strategy development through to contract placement and payment
Minahan and Degan, 2001	The process of utilising web-based technologies to support supply chain networks
Rajkumar, 2001	The application of the internet to increasing the efficiencies and competitive advantage of procurement
Roche, 2001	Automating the whole purchasing process and making order and requisition information available along the entire supply chain
Kheng and Al Hawamdeh, 2002	The use of technology for an internet-based procurement system
Sheng, 2002	A re-engineering of the procurement process
Croom and Johnston, 2003	The mirroring of procurement activities
Bartezzaghi and Ronchi, 2003	The use of technological solutions to enable activities for purchasing of materials, repairs and operating materials (MROs)
Davila *et al*., 2003	The use of the internet on procurement tasks
Knudsen, 2003	Aspects of the procurement function supported by various forms of electronic communication
Min and Galle, 2003	Business-to-business (B2B) procurement practice that utilises e-commerce to identify potential sources of supply, to purchase goods and services, to transfer payment and to interact with suppliers
Presutti, 2003	A technological solution that facilitates corporate purchasing using the internet
Przymus, 2003	The acquisition of goods and services without the use of paper processes
Yen and Ng, 2003	Sourcing, negotiating with suppliers and coordination with R&D functions, which are taking place on the Internet and e-markets

Croom and Brandon-Jones, 2004	The use of internet-based (integrated) information and communication technologies (ICTs) to carry out individual or all stages of the procurement process, including searching, sourcing, negotiation, ordering, receipting and post-purchase reviewing
Kim and Shunk 2004	Procurement using internet technologies, including e-design, e-sourcing, e-negotiation and e-evaluation
Reunis *et al.,* 2004	The technological solution by performing procurement electronically
Vaidya *et al.,* 2004	The use of electronic technologies to streamline and enable the procurement activities of an organisation
Falk, 2005	A process which enables any designated user to requisition a product or service through a web interface
Moon 2005	The automation of a procurement system through web technology adoption
Reunis 2005	The use of internet technology in the purchasing function
Dooley and Purchase, 2006	The use of online technology to assist with the procurement function
Podlogar, 2006	The automated requisition, approval, purchase order management and accounting process through the internet and any other computer networks
Tatsis *et al*., 2006	The integration, management, automation, optimisation and enablement of an organisation's procurement process, using electronic tools and technologies, and web-based applications
Turban *et al*., 2006	The online purchase of goods and services for organisations
Rankin, 2006	The B2B purchase and sale of products and services by electronic means, primarily using the internet
Schoenherr and Tummala, 2007	The sourcing of goods or services via electronic means, usually through the internet and other related technologies

Wu *et al*., 2007	The use of information technologies to facilitate B2B transactions for materials and services purchasing
Gunasekaran and Ngai, 2008	A comprehensive process in which organisations use information technology (IT) systems to establish agreements for the acquisition and purchasing of goods or services
Harrigan *et al*., 2008	B2B purchasing practices that utilise e-commerce to identify potential sources of supply, to purchase goods and services, to transfer payment and to interact with suppliers, resulting in simplifying commercial transactions between organisations
Meier and Stormer, 2009	The connective processes by electronic communication networks between companies and suppliers
Morrison, 2009	Purchasing of goods and services through internet or other information networks
Teo *et al.,* 2009	The streamlining of purchasing processes by eliminating traditional paper-based procurement and adopting online-based procurement
Garrido *et al.,* 2010	The result of utilising e-commerce technology in the organisation's purchasing process
Farzin and Neshad, 2010	Conducting business on purchase and sale of supplies, works and services through the internet as well as other information and networking systems
Khanapuri *et al.,* 2011	The new paradigm in procurement, which acts as an information hub to support business planning and decision-making
Eei *et al*., 2012	The use of integrated information technology for part of, or all of, the procurement functions, from beginning to end, i.e. from searching, sourcing, negotiating, ordering, and receipt to post-purchase review

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APPENDIX B

B1. Details of semi-structured Interview Research Procedures

Procedures	Description
Identify research questions	**Literature review**. A review of the literature on e-procurement adoption is to be carried out to provide the grounding for the identification of research questions. The review also will be used to test the results of interviews. A comprehensive literature analysis will be undertaken to provide better understanding of the existing body of research literature and of the issues, and to locate the research questions within the context of the literature. **Thematising.** The research questions will be identified and the purposes of the research will be formulated.
Data collection methods and techniques	**Multiple case studies.** The researcher will select multiple cases that reflect the research questions in order to have in-depth and detailed information about the issues being investigated. Comparisons will be made among cases that will be beneficial and add confidence to the findings. In this way, the e-procurement adoption phenomenon can be studied in its natural setting. The researcher will be able to understand the nature and complexity of e-procurement adoption. **Interview approach**. According to Yin (1994), by using interview, the research will focus directly on the case study topic. An in-depth interview provides the participant's perspective on the issues.
Selection of the unit of analysis/ case selection	**The unit of analysis.** This is the major entity to be analysed in the study. The researcher will attempt to identify the units of analysis of this study. The first unit of analysis will be the cases to be investigated. Next, the sampling technique will be designed to select the participants. Five different government organisations will be selected for this study. Those organisations must have been involved in adopting e-procurement. **Case selection.** Five organisations will be purposively selected and they must be information-rich, accessible, proximal, large, leading and well-established Indonesian Government organisations. The case selection for this

	study will be through the process of: data collection about Indonesian government organisations that have been the adopters of e-procurement, development of criteria for purposeful sampling, narrowing the potential case studies and determining the final selection of cases.
Interview design	**Semi-structured interviews**. Semi-structured interviews will be designed in which the interview questions are developed to assist the researcher to focus on the issues of e-procurement adoption. Semi-structured interviews allow the participants to talk freely without limiting their responses. **Constructing Effective Questions.** The researcher will construct interview questions in an effective manner. The researcher must ensure that the questions allow him to dig dip into participants' perspectives. In general, the questions should be open-ended to enable the participants to freely express their views. The questions should be neutral, which means there is no attempt to influence or to force the participants. The clarity of questions should be taken into consideration. This includes carefully using specific terms in the questions, while also keeping the questions broad in nature. **Probing/Follow-up questions**. In order to gain optimal responses from the participants, the researcher should be able to construct follow-up questions. Probing questions should be developed in such a manner as to obtain a focus and advance an explanation of the participants' responses. **Interview protocol**. It would be beneficial to prepare the protocol prior to the interviews. It forces the researcher to stick to the procedures and actions that are necessary to maximise the interview outcomes.
Obtaining participants	**Purposive sampling**. The participants will be selected, based on the purpose of the study, to reveal information about e-procurement adoption in the Indonesian public sector. The cases will be chosen from the potential organisations that are information-rich and enable further exploration of their adoption for deeper understanding. From the five organisations, the participants will be selected, based on the criteria of access, convenience, adequacy and appropriateness. Typically, the participants will be the staff who are assigned to e-procurement units or departments. Before commencing interviews, it is essential to reach an agreement with each participating organisation regarding

	its confidentiality requirements and boundaries of the data and identities of the organisations and participants. The researcher will establish contact with the organisations and targeted participants prior to fieldwork.
Invitation/informed consent	**Invitation**. An invitation letter will be delivered to the participants through their personal emails. The invitation will include a brief explanation of the research purposes, its significance, the procedures, any possible risks or harm and the rights of the participants. **Informed consent.** Before commencing the interviews, the researcher will seek consent from the participants. A plain statement regarding the nature of the study will be provided. The researcher will ask the participants to read the statement, so that they understand their positions. A consent form will be offered to the participants. If they agree to participate, they will be asked to sign the form. The researcher will also seek permission to record the interviews.
Interviewing	**Effective communication.** The researcher will establish an appropriate level of effective communication while undertaking the interviews. The researcher will use clear and simple language, without any force upon the participants. The researcher should make the participants feel comfortable enough to reveal information. The interviews will consist of three main phases, namely introduction, main and final phases. The introduction phase will consist of the initiation of contact and also include gaining the trust and understanding of the participants, and information about their backgrounds (education, culture and position). It will commence with the introduction of the purposes and the procedures of the research, the participants' roles and their consent to participate in the study. In the main phase, the researcher will attempt to explore the participants' views on the issues being investigated. In the final phase, the researcher will end the interviews in an ethically acceptable manner, including an explanation of the next steps of the study. **Note taking.** The researcher will take notes on the important points of discussions. The researcher needs to focus on the responses of the participants. **Recording.** It is crucial to tape record the interviews to obtain more accurate records and documentation. It is also useful for further analysis of the interview data. A digital recorder will be used, so that the data can be transferred

	and stored in digital format.
Data Analysis	**Transcribing, coding and interpreting**. The researcher will prepare the interview data for analysis by firstly transcribing the oral data into text data. The researcher will further decide the basis of analysis methods that are appropriate.
Verification	**Reliability and validity**. It will be crucial to determine the reliability and validity of the interview findings. Reliability means the level of consistency of the results, while validity refers to ascertaining whether the findings meet the purposes of the research.

B2. Semi-structured Interview Design

School of Built Environment
Department of Construction Management
Curtin University
GPO Box 1987
Perth 6845, WA Australia

Dear Sir/Madam,

RE: INTERVIEWS FOR E-PROCUREMENT ADOPTION DATA COLLECTION

I am Muhibuddin Napsah. I am a PhD Student at Curtin University Australia, working under the supervision of Professor Peter Love and DR. Jane Matthews. The key issues addressed in this study are to investigate the variables/determinants of the e-procurement adoption. These variables are costs, benefits, barriers, risks and critical success factors. It also seeks to reveal the performance of current e-procurement. This PhD research project is entitled:

"The adoption of e-procurement in Indonesian Public Sector"

Therefore, this letter is aimed to invite you to participate in this research. This study will employ face to face interviews with people who are involving in the e-procurement in the public sector. The interview will take approximately 20-30 minutes to complete depends on the participants. Your participation is voluntary in this interview; you may decide to answer particular questions as your preference. The interviews will be also recorded. The location and time of interview is based on the participants' suitable arrangement.

All information and responses will remain confidential and will be combined with other participants for analysis without any reference to individuals. Personal details and data collected will be strictly kept. Upon the completion of the study, the recorded materials will be erased and destroyed. A copy of interim and final results of this study will be also sent to the participant when requested.

This study may bring potential significance to e-procurement system in Indonesian public sector. This study is expected to contribute to significant saving through e-procurement adoption. A framework for effective and efficient e-procurement will be developed.

I would be very much appreciated if you could participate in the interviews. Please keep this letter for your information. I request you to kindly return the completed consent form via email to the address provided below. For further enquiries, please feel free to contact:

Muhibuddin Napsah
Department of Construction Management, School of Built Environment

Bentley Campus, Building 201, Room 213i
Curtin University
Perth - Western Australia
Mobile : +61 450923312
e-mail : muhibuddinn@yahoo.com

I therefore would appreciate your cooperation to make this interview happen. Thank you very much.
Best wishes,

Muhibuddin Napsah
(PhD student)
Department of Construction Management, School of Built Environment
Curtin University, Australia

Curtin University

CONSENT FORM

Title: "The adoption of e-procurement in Indonesian Public Sector"

NOTE: **This consent form will remain with Curtin University researcher for their records**

I agree to take part in the Curtin University research project specified above. I have had the project explained to me, and I have read the explanatory Statement, which I keep for my records. I understand that agreeing to take part means that:

1. **I agree to be interviewed by the researcher**
2. **I agree to allow the interview to be audio-taped**
3. **I agree to be recontacted in the future for a further information if required**

I understand that I will be given a transcript of data concerning me for my approval before it is included in the write up of the research.

I understand that my participation is voluntary, that I can choose not to participate in part or all of the project, and that I can withdraw at any stage of the project without being penalised or disadvantaged in any way.

I understand that any data that the researcher extracts from the interview for use in reports or published findings will not, under any circumstances, contain names or identifying characteristics.

Participant's name.....

Signature..... **Date**.....

INTERVIEW PROTOCOL

Introduction

In research, it is crucial to develop a research protocol for every stage of the research (Yin 1994). This also includes the research instruments and procedures. In a case study strand with interviews approach, the research protocol assists the researcher during the case research. As the study utilises semi structured interviews, it is necessary to establish the frame regarding the data to be collected, the participants to be selected and reason behind the selection (Miles and Huberman 1984). This also prepares the lists of interview questions and the resources required for the interviews.

Field procedures

Access

Access to the targeted organisations was actually based on the researchers' private contacts. As it entails research on government organisations, the contacts are related to the researchers' work and network. During the early initiation of research data collection, the researcher contacted the staffs of at least seven different organisations. They are the primary contact that may refer the other staffs to participate in this study. The primary contacts are mostly senior staffs that had been involving in e-procurement for many years. A letter of invitation and consent form will be delivered to the potential participants. Should there any positive feedback, the researcher arranges meeting with the participants either personally or in a group.

Resources

- Time: Due to the strict time and the availability of the participants, it is estimated to have around two to four interviews per day. Therefore, the interview for each case will take time about three to four days for interviews. The researcher will stay for couple days in the location.

- Financial resources, costs of travel to Warsaw, from the UK or Poland, costs of the hotel and meals. In some cases the researcher plans to invite interviewees for informal meetings in a restaurant or pub, which would generate additional costs.
- Technical equipment required. A digital recorder and 2 sets of batteries will be prepared. It also requires data cables and laptop to record and to transfer data from the recorder to the laptop. It is also necessary to ensure the compatibility of the recording software in the laptop.
- Other equipment: camera for documentation, printer, paper, pens, notebook, cell phone, places and contact details.

Procedures

Procedures **before** the interview:

- Arrange interview time, date and location
- Provide details about aims of the study, plus confidentiality issues (by e-mail)
- Arrange travel and accommodation
- Confirm interview time and place 1-2 weeks before interview date
- Read research questions and interview schedule
- Read data already collected about case organisation
- Check recorder and other equipment required
- Check where meeting place is located and how to get there
- Arrive 30 minutes before scheduled interview time and wait

Procedures **during** the interview

- Introduction – about researcher and research
- Repeat about confidentiality
- Ask again how much time is available for the interview
- Ask for permission to record the interview
- Start interviewing
- Thanks for participation
- Explain what the next steps are and what will happen with the collected data

Procedures **just after** the interview

- Record comments (same day)
- Transfer data to the laptop
- Check that transferred data are good quality and easy to understand
- Make a copy of the data – CD or memory stick
- Replace batteries in the recorder
- Send e-mail to participant with thanks for his/her time and help
- Send e-mail, call or meet “primary contact” to thank and them say what happened and what are next planned steps

Procedures **after** the interview

- Transcribe the interview
- Transcribe own comments
- Create copies of all transcripts

Technical Instructions

Good day. I am Muhibuddin Napsah. I am a PhD Student at Curtin University Australia. Currently, I am conducting a research on the e-procurement adoption in the Indonesian Public Sector. As previously mentioned in the invitation letter, I would like to reinform you about the key issues on this study.

In this interview, I would like to get your opinions about the adoption of e-procurement that you have been involved in your institution. In particular, I am interested with the variables and aspects of the e-procurement adoption such as costs, benefits, barriers, risks and critical success factors. In addition, this interview is also intended to reveal the performance of current e-procurement.

Before we start, I would like to let you know that your participation is voluntary in this interview. All information and responses will remain confidential and will be combined with other participants for analysis without any reference to individuals. The interview will take about 20-30 minutes to complete.

Tape Recorder Instructions

I also would like to ask again for your permission for tape-recording our conversation. It is simply aimed to get the record and to note details of your responses.

Preamble/Consent Form Instructions

Before start, I would like you to read again the introduction. Please make sure you read the consent form carefully and please make sure you sign it as a proof for your agreement to participate in this study. Please feel free and let me know, if you need further information. Thank you very much for your participation.

DATA COLLECTION ETHICAL CONSIDERATIONS

An important aspect for academics and the conduct of the research is the research ethics (Wells 1994, Churcill 1995). Ethics is underpinned with moral principles and values that entail the research. Ethical consideration according to Bryman (2004) quoting Diener and crandall (1987), must governs:

- Avoid any kinds of forces to participants
- Reject any kinds of deception to gain data
- Ensure confidentiality and anonymity of the results collected
- Involve the participants who consent fully

This study has adopted several measures to address the ethical consideration in line with the Curtin University ethical guidelines. Although this study was conducted in low/minimum risk, the ethical clearance has been proposed. This ethical clearance is aimed to ensure all involving participants in this study are not put in to any risks or harm (Fisher 2007). This will also focuses on:

- Informed consent (Wells (1994)
- Risk to privacy and confidentiality (Bryman and Bell 2007)
- Risk of harm to participants or related subjects (Fisher 2007)

Having acknowledged the significance of ethical clearance during this study, it will ensure the following points:

- The involvements of participants are voluntary. There will be no attempt to force or pressure the participant, neither any kinds of inducements and payment.
- As this study involving participants from public organisations, all information will be completely confidential and anonymous. When required, interviewees will be provided with a copy of the Interview consent for their records.
- Participants will be informed that information and data including electronic data will be kept for a minimum period of five years after the data of thesis publication. It will be stored with adequate supervision in safe and secure location on computer Hard disk and CDR or similar for back up. At the end of this period all data will be destroyed. Only the student and the thesis committee will have access to the data.

- The research will be conducted adhere to the ethical research guideline provided by Curtin University and thesis committee.

Curtin University

"The Adoption of e-procurement"

Date : …… **Start Time** : ……

Location : …… **Finish Time** : ……

Ref : ……

Interviewer : **Muhibuddin Napsah**

Gender : ……

Organization of the Interviewee : ……

Position : ……

Educational background : ……

Working experience : ……

Additional note : ……

Contact number (Mobile) : ……

Email : ……

GENERAL INFORMATION

☞ E-procurement adoption can be viewed as the use of ICT to support the purchasing of goods and services in an organisation. In the context of this study, it is the uses electronically procurement based on the acquisition of goods and services in Indonesian public sector.

1. Personal details
    a. Current roles at e-procurement unit

    _____

    b. Relevant competencies (Training, certification and skills)

    _____

2. Current status of e-procurement at respondent's institution
    a. Time frame of e-procurement adoption. Types of activities on e-procurement.

    _____

    b. Types of projects procured via e-procurement

    _____

3. Organisational structure
    a. Department assigned for e-Procurement

    _____

    b. Number of employees/organisational structure and hierarchy.

    _____

    c. Organisations' resources (Infrastructure, financial support, consultancy, stakeholders, business partnership)

    _____

4. E-procurement activities details
    a. Volume and numbers of transaction via e-procurement.

    _____

    b. Technical and IT supports

    _____

    c. Evaluation, measurement and improvement processes and criteria. (Time based, purposive)

    _____

    d. Investment for e-procurement.

    _____

E-PROCUREMENT ADOPTION VARIABLES

☞ The term of strategic, tactical, and operational have been used to distinct each variables of e-procurement adoption. Strategic refers to the variables that associated with organisational changes, policy and decision making. Tactical concerns the exploration and advancement of relationship, whereas operational means effective and efficient in processes.

A. Perceived Benefits

Could you identify the major benefits gained from e-procurement adoption in your institution, in term of: Strategic, Tactical, and Operational.

_____

B. Perceived Costs

Could you identify of the major costs derived from e-procurement adoption in your institution, in term of: Strategic, Tactical, and Operational

_____

C. Perceived Risks

Could you identify the possibility of risks that may posed e-procurement adoption in your institution and to what extent do they take place, in term of: Strategic, Tactical, and Operational?

_____

D. Perceived Barriers

Could you identify the major barriers that impede e-procurement adoption in your institution, in term of: Strategic, Tactical, and Operational?

_____

E. Critical Success factors

What do you perceive to be the factors that are critical to the success of e-procurement adoption in your institution, in term of: Strategic, Tactical, and Operational?

_____

E-PROCUREMENT QUALITY AND PERFORMANCE DIMENSIONS

(Identification of major variables associated with the quality and performance of e-procurement adoption at the respondents' institution). Could you identify what are the variables of e-procurement quality and performance in the adoption of e-procurement in your institution? And to what extent do the variables take place in current practice in term of;

- Professionalism
- Systems and process
- Competence
- Specification
- Assurance

Additional comments: ……..……

Thank you very much.

APPENDIX C

C1 Survey Questionnaire Design

QUESTIONNAIRE ON

THE ADOPTION OF E-PROCUREMENT

This questionnaire is set up to identify the current practice of electronic procurement in the Indonesian Public Sector. This questionnaire has been designed to gather required data in relation to the adoption of electronic procurement in your institution. Your participation in the survey is voluntary and your answer will be kept strictly confidential.

This questionnaire consists of 3 (Three) parts. They are:

1. General information on current e-procurement practice
2. Identifying variables of electronic procurement
    a. Benefits
    b. Costs
    c. Risks
    d. Critical Success Factors
3. Identifying the E-Procurement Quality (EPQ) variables.

The rating systems for this questionnaire survey as follows:

Likert Scale/ Rating Score	Level of Importance
5	Very large extent
4	Large Extent
3	Moderate
2	Limited extent
1	Not at all

Your participation in the survey is voluntary and your answer will be kept strictly confidential. The survey should take about 20 minutes to complete. Please read each question carefully and make sure that all questions are answered.

A free copy of a report summarising the results of this survey will be provided upon request. Please complete your details in the last section of this questionnaire
Thank you very much for your cooperation.

Yours sincerely,

Muhibuddin Napsah
(PhD student)
Department of Construction Management, School of Built Environment
Bentley Campus, Building 201, Room 213i
Curtin University
Perth - Western Australia

Part 1. **General information on current e-procurement practice**

Please tick one for each question.

1. To what extent has your organisation implemented the e-procurement?

Not at all		**Moderate**		**Very large extent**
1	**2**	**3**	**4**	**5**
☐	☐	☐	☐	☐

2. How many people/staff are currently assigned in managing the e-procurement activities at your institution?

☐ ≤ 5 ☐ 5 - 10 ☐ 10 - 20
☐ 20 - 30 ☐ ≥ 30

3. How long have you been involved in e-procurement practices?

☐ ≤1 year ☐ 1-2 years ☐ 2-5 years
☐ 5-10 years ☐ ≥10 years

4. What is your current role and position at the e-procurement unit?

☐ Supervisor/head of unit ☐ Project officer (PPK)
☐ Tender Committee ☐ Work group/team
☐ Supporting Staff ☐ Secretariat staff
☐ Head of Institution ☐ Project Result Receiver Committee
☐ Budget Authority (PA) ☐ Internal Office verificatory/Auditor

5. What kind of procurement training/course have you attended?

☐ National procurement certification ☐ Project management
☐ IT for e-procurement ☐ Elementary procurement course
☐ ToT for Procurement ☐ SPSE application for e-procurement
☐ Procurement Legal aspects

6. In regards to investment on IT infrastructure, can you estimate the amount of money invested for adopting the system?

   ☐ ≤ Rp.50 Million ☐ Rp. 50-100 Million ☐ Rp. 100-150 Million
   ☐ ≥ Rp. 150 Million ☐ Not sure

Part 2. Identifying variables of electronic procurement

a. Perceived benefit

To what extent do you perceive the following benefits have been acquired by implementing e-procurement in your institution?

For the purpose of this study **strategic benefits** are defined as those that are associated cannot be immediately quantified. **Tactical** and **Operational benefits** are those that directly emerge from processes, activities, or functionalities that quantifiable.

Benefits	Not at all		Moderate		Very large extent
	1	2	3	4	5
Strategic Benefits					
• Fosters transparency and openness of public procurement	☐	☐	☐	☐	☐
• Improved competitive advantage	☐	☐	☐	☐	☐
• Improved public opinions and awareness of public e-procurement	☐	☐	☐	☐	☐
• Improved communication and coordination between stakeholders (users and vendors)	☐	☐	☐	☐	☐
• Improved accountability	☐	☐	☐	☐	☐
Operational benefits					
• Reduce procurement costs (transactions, administration, etc.)	☐	☐	☐	☐	☐
• Reduced in cycle time (i.e. time to procure goods and services)	☐	☐	☐	☐	☐
• Reduced external pressure	☐	☐	☐	☐	☐
• Ease of use (user friendly)	☐	☐	☐	☐	☐
• Improved operational workflows	☐	☐	☐	☐	☐
• Improved security and confidentiality of transactions	☐	☐	☐	☐	☐
• Reduction in staffing costs	☐	☐	☐	☐	☐
Tactical Benefits					
• Provides standardisation (documents and processes)	☐	☐	☐	☐	☐

• Encourages IT penetration and use of e-government solutions	☐	☐	☐	☐	☐
• Improved competition	☐	☐	☐	☐	☐
• Reduced corruption and collusion in tender activities	☐	☐	☐	☐	☐
• Enhanced regulatory compliance	☐	☐	☐	☐	☐

b. Costs

To what extent has your organisation experienced the following costs related to e-procurement implementation?

Direct costs are those derived from the implementation and operation of e-procurement. **Indirect costs** are associated with any influence of e-procurement on work activities that cannot be readily quantified.

Costs	**Not at all**		**Moderate**		**Very large extent**
	1	**2**	**3**	**4**	**5**
Direct costs					
- Infrastructure investment					
- Human resource development (trainings and workshops for staff)	☐	☐	☐	☐	☐
- Operational and maintenance	☐	☐	☐	☐	☐
- System development and upgrade	☐	☐	☐	☐	☐
- Rewards, incentives and salary scheme for staff	☐	☐	☐	☐	☐
- Hardware and IT equipment	☐	☐	☐	☐	☐
- Server and internet connection	☐	☐	☐	☐	☐
- Consultancy support	☐	☐	☐	☐	☐
Indirect costs					
- Social costs (publication, socialisation and public involvement)	☐	☐	☐	☐	☐
- Partnership costs (developing public awareness and knowledge of vendors and public)	☐	☐	☐	☐	☐
- Organizational costs (Structure changes)	☐	☐	☐	☐	☐
- Overtime processes	☐	☐	☐	☐	☐
- Staff working motivation	☐	☐	☐	☐	☐
- Heavy workload/strains on resources	☐	☐	☐	☐	☐

c. Risks

To what extent the following risks may affect the uptake of the e-procurement at your institution?

Risks	Not at all		Moderate		Very large extent
	1	2	3	4	5
Internal Risks					
- Security and privacy risk (information, data and transaction)	☐	☐	☐	☐	☐
- Internet and network risk	☐	☐	☐	☐	☐
- Human risk (Level of knowledge, leadership and staffing)	☐	☐	☐	☐	☐
- Organisational change	☐	☐	☐	☐	☐
- System integration	☐	☐	☐	☐	☐
- Funding risk for operational and maintenance	☐	☐	☐	☐	☐
- Time frame risk (processes)	☐	☐	☐	☐	☐
- Legal aspect risk	☐	☐	☐	☐	☐
External Risks					
- Partnership/dependency risks	☐	☐	☐	☐	☐
- Environment risks (social and political)	☐	☐	☐	☐	☐
- Economic risks	☐	☐	☐	☐	☐
- Public involvement risk (resistance)	☐	☐	☐	☐	☐
- Lack of system expertise from vendors	☐	☐	☐	☐	☐

d. Critical Success Factors

To what extent do you think the following factors that may influence the success of the uptake of e-procurement?

Success Factors	Not at all		Moderate		Very large extent
	1	2	3	4	5
Technological factors					
- System integration and interoperability	☐	☐	☐	☐	☐
- Investment on infrastructure	☐	☐	☐	☐	☐
- Technology and system development	☐	☐	☐	☐	☐
- User friendly system	☐	☐	☐	☐	☐
- Security and authentication	☐	☐	☐	☐	☐
Organisational Factors					
- Organisation resources	☐	☐	☐	☐	☐
- Organisational structure and culture	☐	☐	☐	☐	☐
- Human resource development (trainings,	☐	☐	☐	☐	☐

incentives)					
- Commitment and support from internal	☐	☐	☐	☐	☐
- Sufficient funding for operational and maintenance	☐	☐	☐	☐	☐
- Standardised documents and procedure nationally	☐	☐	☐	☐	☐
Environment factors					
- Partner/public awareness and support	☐	☐	☐	☐	☐
- Coordination and communication between stakeholders	☐	☐	☐	☐	☐
- Regulatory and legal aspects	☐	☐	☐	☐	☐
- Support from central government	☐	☐	☐	☐	☐

Part 3. Identifying e-procurement Quality (EPQ) and Adoption/Use variables

This part formulates to identify the perceived quality variables (EPQ scale) that measure the users' attitudes toward e-procurement system and its supports. The use construct measures the level of acceptance to use/adopt the e-procurement.

To what extent has your organization experienced the following quality variables in the adoption of e-procurement?

EPQ variable	**Not at all**		**Moderate**		**Very large extent**
	1	**2**	**3**	**4**	**5**
PROFESSIONALISM					
- The Purchasing department is always available to deal with my queries (Support Availability)	☐	☐	☐	☐	☐
- The Purchasing department always gets back to me when they say they will (Support Reliability)	☐	☐	☐	☐	☐
- The Purchasing department responds quickly to my queries (Support Responsiveness)	☐	☐	☐	☐	☐
- The Purchasing department is knowledgeable in dealing with my queries (Support Knowledge)	☐	☐	☐	☐	☐
- The Purchasing department is flexible when dealing with unusual requests or problems (Support Flexibility)	☐	☐	☐	☐	☐
- The Purchasing department deals effectively with any problems (Problem resolution)	☐	☐	☐	☐	☐
- The Purchasing department deals confidentiality with my queries (Confidentiality)	☐	☐	☐	☐	☐
- The Purchasing department is friendly when	☐	☐	☐	☐	☐

dealing with queries (Friendliness)					
- The Purchasing department shows concern when dealing with my queries (Attitudes/concern shown)	☐	☐	☐	☐	☐
PROCESSING					
- The e-procurement system ensures order processing speed (Order processing speed)	☐	☐	☐	☐	☐
- The e-procurement system has an efficient authorisation process (Ease of authorisation)	☐	☐	☐	☐	☐
- The e-procurement system ensures orders get to suppliers quickly (Orders to suppliers speed)	☐	☐	☐	☐	☐
- The e-procurement system reduces the lead time of orders (Order lead time)	☐	☐	☐	☐	☐
- The e-procurement system is capable of processing complex orders (Processing complex orders)	☐	☐	☐	☐	☐
- The e-procurement system ensures that orders arrive on time (On-time delivery)	☐	☐	☐	☐	☐
- The e-procurement system ensures that the right goods or services are delivered (Order accuracy)	☐	☐	☐	☐	☐
- The e-procurement system is secure (System security)	☐	☐	☐	☐	☐
TRAINING					
- The purchasing department provided me with timely training to use the system (Timely Training)	☐	☐	☐	☐	☐
- The purchasing department provided me with appropriate training to use the system (Appropriate Training)	☐	☐	☐	☐	☐
- The purchasing department provides useful information about the system (Information Provision)	☐	☐	☐	☐	☐
SPECIFICATION					
- The e-procurement system works effectively alongside the financial management system (FMS Integration)	☐	☐	☐	☐	☐
- The e-procurement system ensures easy reconciliation of invoices with requisitions (Invoice reconciliation)	☐	☐	☐	☐	☐
- The e-procurement system allows configuration by departments (System Configurability)	☐	☐	☐	☐	☐
- The e-procurement system allows appropriate reports to be run (Reporting Capability)	☐	☐	☐	☐	☐
CONTENT					
- The e-procurement system has the right number of suppliers loaded (Loaded Suppliers)	☐	☐	☐	☐	☐
- The e-procurement system has the right number	☐	☐	☐	☐	☐

of catalogues loaded (Loaded Catalogues)					
- The e-procurement system allows easy searching (Ease of Search)	☐	☐	☐	☐	☐
USABILITY					
- The e-procurement system is available at all times (System Availability)	☐	☐	☐	☐	☐
- The e-procurement system moves quickly from one scree to the next (Screen Loading speed)	☐	☐	☐	☐	☐
- The e-procurement system allows easy navigation through the process (System Navigation)	☐	☐	☐	☐	☐

To what extent has your organization experienced the following adoption variables in the adoption of e-procurement?

Adoption/Use variable	**Not at all**		**Moderate**		**Very large extent**
	1	**2**	**3**	**4**	**5**
The system is useful (**Nature of Use**)	☐	☐	☐	☐	☐
The information retrieval is satisfactory (**Navigation Patterns**)	☐	☐	☐	☐	☐
The frequency of use with the e-procurement system is high (**Number of visits**)	☐	☐	☐	☐	☐
The number of transaction via e-procurement system is high (**Number of Transactions**)	☐	☐	☐	☐	☐

Thank you very much for your time and assistance in completing this questionnaire. If you have any concerns regarding the research, please feel free and do not hesitate to seek further information about the research or participation. For further enquiries, please feel free to contact:

Human Research Ethic Committee
Office of Research and Development
Curtin University
Perth 6845, WA Australia
Telephone (+618) 9266 2784
Fax. (+618) 9266 3793
Email: hrec@curtin.edu.au

If you wish to receive a copy of the report detailing the questionnaire results, please complete the following details.
Name:
Institution:

Address 1:
City/Town:
State/Province:
ZIP/Postal Code:
Email:
Address:

C2 Online Survey/Questionnaire Research Procedure Details

Survey design Steps	Description
Defining objectives and information to be investigated	**Literature review**. A detailed survey of literature in the field of e-procurement was carried out to reveal the status and the future trends of e-procurement worldwide. The status of e-procurement in Indonesian public sector in particular was obtained. The main issues and framework is designed to be tested via survey questionnaire.
Sample selection	**Random sampling**. A representative sampling for survey has been the most crucial issue. To be representative, the response rate therefore must be high. The sample is selected randomly from the target population. In this study, people who are involving in the e-procurement adoption in Indonesian public sector have been targeted. Large numbers of participants are required to improve the level of accuracy, reliability, valid results, and representativeness to make generalisations of findings.
Questionnaire type and data collection method	**Close ended questionnaire**. Closed ended questions are used in the questionnaire. As the response categories are provided, the respondents simply have to choose the options. The response categories are captured using scale respons. This becomes more popular approach as it enables easier to score ordinal data. However, it is sometimes difficult to complete as it force discrimination. **Web survey method.** In this study the web survey approach is selected as data collection method. It offers lower costs and fewer resources to be used. It enables saving in paper works and other materials, it is environmental friendly. Web survey also enables faster response speed. Another reason is the typical population of this study have the access to the web and internet. The geographical barrier is also the force behind the web survey selection as Indonesian archipelago consists of huge coverage. Therefore, the suitable approach to this survey is via web survey.

Constructing questionnaire	**Survey instrument development**. The design of survey/questionnaire is critical for getting correct response. The clarity, accessibility and consistency of the survey affect the response rate and the quality of data obtained. The skeleton of the questionnaire was informed by the literature review. The questions on the questionnaire where gathered from the review of literature and models. Instrument of questions should focus only to the research purpose and objectives. **Web Layout and Presentation**. The design via web survey provides potential effective questionnaire layout, format and presentation. Web survey enables the researcher to design the questionnaire much faster and easier. Nowadays, many web survey providers have developed standard format or template that can be suited or tailored to special design.
Define response options type	**Ranking scale**. Standardise response format is used to enable ease and faster completion of survey by the participants. In this study, The scale response options use the likert scales.
Pretesting and piloting questionnaire	**Piloting**. The questionnaire is pretested and piloted to about 10 people who are chosen for reasons such us convenience, access, and adequacy. **User orientation and instructions**. It is aimed to identify the possible difficulty encountered by respondents. This might be the misunderstanding or misinterpretation on the questions and the questionnaire instructions. **Ease of editing and analysis.** In this study the pretesting and piloting is conducted with a small number of respondents (about 10 people) who are chosen for reasons such us convenience, access, and adequacy. The evaluation will take place accordingly, and revision of questionnaire will be conducted when required. This Supports editing and offers ease for the analysis.
Invitation/transmittal letter	**Email invitation.** Both email and the web for survey data collection is utilised in this study. The participants are invited to survey via email. The participants are directed to the web site to complete the survey. **Faster transmission.** The time line for invitation becomes faster via email.

C3 Goodness-of-Fit Assessment (Fitness Indices)

Summary of GFIs

Name of category	Index	Acceptance value	Reference	Comments
Absolute Fit	Chi-Square ($\chi 2$)	P > 0.05	Wheaton *et al.* 1997, Byrne 2001, Kline 2005	The value of $\chi 2$ is sensitive to the sample size (>200) and tends to be more inaccurate with large sample size (Byrne, 2001)
	RMSEA (Root Mean Square-Error of Approximation)	RMSEA < 0.08	Browne and Cudeck 1993, Kline 2005	RMSEA< 0.05 is considered 'good' fit. $0.05 \leq$ RMSEA $\leq$ 0.08 is considered 'adequate' fit. RMSEA< 0.10 is acceptable and considered as the lower bound of fit
	GFI (Goodness-of-Fit)	GFI $\geq$ 0.90	Hoyle and Panter 1995, Hair et al. 1998, Kline 2005	GFI close to 0 indicates a poor fit, while GFI close to 1 indicates a perfect fit
Incremental Fit	AGFI (Adjusted Goodness-of-Fit)	AGFI > 0.90	Tanaka and Huba 1985, Byrne 2001.	AGFI range is 0.90 to 0.95 (Byrne, 2001, p.82). AGFI = 0.95 is a good fit
	CFI (Comparative Fit Index)	CFI $\geq$ 0.90	Bentler 1990, Kline 2005	CFI = 0.95 is a good fit
	TLI (Tucker Lewis Index)	TLI > 0.90	Bentler and Bonnett 1980, Hair et al 1998	An incremental fit measure, acceptance level value > 0.90 (Hair et al., 1998, p.622); TLI = 0.95 is a good fit
	NFI (Normed Fit index)	NFI $\geq$ 0.90	Bollen 1989, Kline 2005	NFI close to 0 indicates poor fit; while NFI close to 1 indicates perfect fit, NFI = 0.95 is a

				good fit
Parsimonious Fit	Chisq/df (Normed Chi-square)	Chisq/df < 5.0	Marsh and Hocevar 1985	Should be < 5.0

C4 Reliability Measures

Summary of Reliability Measures

Measure	Acceptance value	Reference	Comments
Cronbach's Alpha	Alpha > 0.70	Nunnally (1978)	Alpha of 0.70 and over is acceptable to indicate internal consistency
Construct Reliability (CR)	CR ≥ 0.60	Fornell and Larcker 1981, Bagozzi and Yi 1988	The internal consistency assessment using confirmatory factor analysis (CFA)
AVE (Average Variance Extracted)	AVE > 0.50	Fornell and Larcker 1981, Bagozzi and Yi 1988	

C5 Validity Measures

Summary of Validity Measures

Name of category	Index	Acceptance value	Reference	Comments
Content Validity	-	-	Malhotra, Agarwal, and Peterson, 1996; Malhotra (2004	Related literature and open-ended questions as methods to improve content validity was undertaken during questionnaire development
Construct Validity	GFI (Goodness-of-Fit)	AGFI > 0.90	Hoyle and Panter 1995, Hair et al. 1998, Kline 2005	This validity is achieved when the fitness indices meet the requirements
	CFI (Comparat	CFI ≥ 0.90	Bentler 1990, Kline 2005	

	ive Fit Index)			
	RMSEA (Root Mean Square-Error of Approximation)	RMSEA < 0.08	Browne and Cudeck 1993, Kline 2005	
	Chisq/df (Normed Chi-square)	Chisq/df < 5.0	Marsh and Hocevar 1985	
Convergent Validity	AVE (Average Variance Extracted)	AVE > 0.50	Fornell and Larcker 1981	The AVE value of 0.50 and higher indicates a sufficient degree of convergent validity
	Item Reliability	Factor Loading < 0.50	Nunnaly and Bernstein 1994	Factor loading (the relationship between an item and its scale) should be less than the minimum cut-off of 0.50
	Composite Reliability	CR > 0.70	Nunnaly and Bernstein 1994	The scale reliability value is required to be above the minimum of value 0.70
Discriminant Validity	Square Root of AVE and correlation of latent constructs	All the correlation between these construct should below 0.85.	Afthanorhan, 2013	The correlation values for each construct should be lower than the square root of AVE in order to obtain the validity of measurement model

APPENDIX D

D1 Coding Description

Description of Coding for NVivo

Items	Benefit classification	Perceived Benefits	Coding
Benefits	**Strategic Benefits**	Promote transparency and openness	TRANS
		Improve public opinion and awareness of the system	PUBOP
		Improve accountability	ACCON
	Operational Benefits	Generate savings and reduce costs	SAVEC
		Time-saving	TSAVE
		Minimise interaction and intervention	INTER
		Offer easiness	EASY
		Efficient and effective procurement processes	EFFEC
		Security and confidentiality of transactions	SECUR
	Tactical Benefits	Provide national standardisation of documentation and processes	STAND
		Encourage IT penetration and use of e-government solutions	
		Support fair competition	FAIRC
		Curb potential for corruption, collusion and nepotism	CORRU
		Minimise affiliation and misconduct	AFFIL
Costs	**Direct**	Infrastructure investment cost	INFRA
		Operational costs and maintenance	OPMAN
		Training and human resource development	TRAIN
		Rewards, incentives and salary schemes	REWRD
	Indirect	Social costs	SOCIC
		Organisational changes	ORGCH
Risks	**Internal**	Security of information and transactions	SECIN
		Internet and network failure	INTFA

		System failure	SYSFA
		Human error	HUMER
		Staff turnover risk	TURNO
		Organisational risk	ORGRI
		System integration	SYINT
		Adaptability and interoperability	ADAPT
		Funding	FUNDR
		Legal aspects	LEGAS
	External	IT readiness risk	READY
		Resistance from internal and external risk	INTEX
		Lack of e-procurement system knowledge	SYSKN
Success Factors	**Technology**	Investment on infrastructure	INVIN
		Technology and system development	TECSD
	Organisation	Human resources development and upgrading	HRDUG
		Commitment and support from stakeholders	COMIT
		Sufficient funding for operational costs and maintenance	FUNOP
		Organisational culture and structure	ORGCS
	Environment	Coordination and communication between stakeholders	COCOM
		Socialisation and public involvement	SOCIA
		Regulatory and legal aspects	REGLE
		Support from central government	CENGO

D2 Case Study: Organisation 1

Details of Interviewees of Organisation 1, Central Government

No.	Interviewee code	Description
1	LKPPIKA	- Decision-maker (Director of e-procurement) - Over 20 years of experience in procurement and was one of the initiators of e-procurement adoption in Indonesia - Engineering background
2	LKPPSUG	- Information and Technology (IT) operation Divisional staff of the directorate of e-procurement - IT expertise - More than 5 years' of experience dealing with e-procurement system (SPSE)
3	LKPPATM	- Staff of control, monitor and evaluation division - About 3 years' experiences in budget, activities, human resources control and monitoring related with e-procurement activities in Indonesia

List of Benefits Identified from Organisation 1 (NVivo Result)

CODING	LKPPSUG	LKPPIKA	LKPPATM	TOTAL
ACCON	0	1	1	2
CORRU	1	0	1	2
EFFEC	0	0	1	1
FAIRC	0	0	1	1
INTER	1	0	0	1
ITPEN	1	1	1	3
PUBOP	1	1	1	3
SAVEC	1	1	1	3
STAND	0	1	0	1
TRANS	1	1	1	3

List of Costs Incurred from E-Pprocurement Adoption – Organisation 1 (NVivo Result)

CODING	INFRA	OPMAN	SOCIC	TRAIN	TOTAL
LKPPSUG	1	1	0	1	3
LKPPIKA	1	1	1	0	3
LKPPATM	1	0	0	1	2

List of Risks of E-Procurement Adoption, Organisation 1 (NVivo Result)

CODING	LKPPATM	LKPPIKA	LKPPSUG	TOTAL
ADAPT	0	1	1	2
FUNDR	0	0	1	1
HUMER	0	0	1	1
INTEX	0	1	0	1
LEGAS	0	0	1	1
ORGRI	1	0	0	1
SECIN	1	0	1	2
SYSFA	1	0	0	1
SYSKN	1	1	0	2
TURNO	1	0	0	1

List of E-procurement Success Factors, Organisation 1 (NVivo Result)

CODING	LKPPSUG	LKPPIKA	LKPPATM	**TOTAL**
CENGO	0	1	0	**1**
COCOM	1	1	0	**2**
COMIT	1	1	1	**3**
HRDUG	1	1	1	**3**
INVIN	0	0	1	**1**
ORGCS	0	0	1	**1**
REGLE	1	1	1	**3**
SOCIA	0	1	0	**1**
TECSD	1	1	1	**3**

D3 Case Study: Organisation 2

Details of Interviewees of Organisation 2, (procurement unit in local government)

No.	Interviewee code	Description
1	SBYTRI	- Head of procurement unit/decision-maker - Certified for procurement L4 and more than 10 years of experience in public procurement practices
2	SBYAAR	- Secretary of procurement unit - Certified for procurement L2 and more than 5 years' experience in public procurement practices
3	SBYAGR	- Coordinator of construction working groups (Procurement Committee) - Certified for procurement L4 and more than 10 years' experiences in public procurement practices
4	SBYAGU	- Administrator of work group in procurement unit - Up to 3 years' experience in public procurement practices
5	SBYAZI	- Secretariat staff of work group in procurement unit - More than 5 years' experience in public procurement practices
6	SBYBRI	- Procurement officer of construction work group - Certified for procurement L and more than 5 years' experience in public procurement practices
7	SBYDID	- Administrator staff of construction work group - More than 5 years' experience in public procurement practices
8	SBYDWI	- Procurement officer of construction work group - Certified for procurement L and more than 10 years' experience in public procurement practices
9	SBYENI	- Coordinator of goods purchasing work group (Procurement Committee) - Certified for procurement L2 and more than 5 years' experience in public procurement practices
10	SBYLOL	- Coordinator of construction and consulting services work - Certified for procurement L4 and more than 10 years' experiences in public procurement practices
11	SBYSAM	- Coordinator of goods purchasing work group (Procurement Committee) - Certified for procurement L4 and more than 10 years' experiences in public procurement practices
12	SBYSHO	- Administration staff of procurement unit - More than 5 years' experience in public procurement practices

13	SBYYAN	- Administration staff of procurement unit - More than 5 years' experience in public procurement practices

List of Benefits Identified from Organisation 2 (NVivo Result)

CODING	SBYYAN	SBYTRI	SBYSHO	SBYSAM	SBYLOL	SBYENI	SBYDWI	SBYDID	SBYBRI	SBYAZI	SBYAGU	SBYAGR	SBYAAR	**TOTAL**
ACCON	0	0	0	0	0	1	0	0	1	0	0	0	0	**2**
AFFIL	0	0	1	0	1	0	0	0	0	0	0	0	0	**2**
CORRU	1	1	1	1	1	1	1	1	1	1	1	1	0	**12**
EASY	1	0	0	1	0	0	0	0	1	1	1	1	1	**7**
EFFEC	1	0	0	0	0	0	0	1	1	0	0	0	1	**4**
FAIRC	0	0	0	1	0	1	0	0	0	0	0	1	0	**3**
INTER	1	1	0	1	0	0	1	1	1	0	1	1	0	**8**
PUBOP	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
SAVEC	1	0	1	0	1	1	1	1	1	1	0	1	1	**10**
SECUR	0	0	0	0	0	0	0	0	1	1	0	0	0	**2**
STAND	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
TRANS	0	1	1	1	0	1	1	1	1	1	1	1	1	**11**
TSAVE	1	0	0	0	0	0	1	0	0	1	0	1	0	**4**

List of Costs Identified from Case Organisation 2 (NVivo Result)

CODING	INFRA	OPMAN	REWRD	TRAIN
SBYYAN	1	1	1	1
SBYTRI	1	1	0	1
SBYSHO	0	1	1	1
SBYSAM	1	1	1	1
SBYLOL	1	1	0	1
SBYENI	1	1	0	1
SBYDWI	0	1	0	1
SBYDID	1	0	0	1
SBYBRI	1	1	0	1
SBYAZI	1	1	0	1
SBYAGU	1	1	1	1
SBYAGR	1	1	1	0
SBYAAR	1	1	1	1
TOTAL	**11**	**12**	**6**	**12**

List of Risks Identified from Case Organisation 2 (NVivo Result)

	SBYYAN	SBYTRI	SBYSHO	SBYSAM	SBYLOL	SBYENI	SBYDWI	SBYDID	SBYBRI	SBYAZI	SBYAGU	SBYAGR	SBYAAR	**TOTAL**
HUMER	1	1	1	1	0	1	1	1	1	0	0	0	1	**9**
INTFA	1	0	1	0	1	1	0	1	0	1	0	0	1	**7**
LEGAS	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**
MISCO	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
READY	0	0	0	0	0	0	1	0	0	0	0	1	0	**1**
SECIN	0	0	0	0	1	1	1	1	1	1	0	1	1	**8**
SYINT	0	0	1	1	1	1	0	1	1	1	1	1	1	**10**
SYSFA	1	0	1	0	0	1	1	1	1	1	1	0	1	**9**
SYSKN	0	0	0	1	0	0	0	1	0	0	0	0	0	**2**
TSCHE	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
TURNO	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**

E-procurement Success Factors; Case Organisation 2 (NVivo Result)

CODING	SBYYAN	SBYTRI	SBYSHO	SBYSAM	SBYLOL	SBYENI	SBYDWI	SBYDID	SBYBRI	SBYAZI	SBYAGU	SBYAGR	SBYAAR	**TOTAL**
CENGO	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
COCOM	1	1	0	0	0	0	1	1	1	0	0	1	1	**7**
COMIT	1	1	1	1	1	1	1	1	1	1	0	1	1	**12**
FUNOP	0	1	1	1	1	0	0	1	0	1	1	0	0	**7**
HRDUG	1	1	1	1	1	1	1	1	1	1	1	0	1	**12**
INVIN	0	1	1	1	0	0	1	0	1	0	1	0	0	**6**
ORGCS	0	0	0	0	0	0	0	0	1	1	1	1	0	**4**
REGLE	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
SOCIA	0	0	0	1	0	1	1	1	1	0	0	1	1	**7**
TECSD	1	0	0	0	1	0	0	0	1	1	1	0	0	**5**

D4 Case study: Organisation 3

Details of Interviewees: Organisation 3

No	Interviewee code	Description
1	MKSLIN	- Head of the building and housing work group. - Certified for procurement and 10 years of experience in public procurement practices
2	MKSKHA	- Head of bridge and road work group - Certified for procurement L and more than 10 years' experience in public procurement practices
3	MKSASD	- Procurement officer of bridge and road work group - Certified for procurement L and more than 2 years' experience in public procurement practices
4	MKSFUL	- Procurement officer of bridge and road work group - Certified for procurement L and more than 2 years' experience in public procurement practices
5	MKSLEN	- Procurement officer of bridge and road work group - Certified for procurement L and more than 5 years' experience in public procurement practices
6	MKSFAR	- Procurement officer/secretary in work group of Building and housing construction - Certified for procurement L and more than 5 years' experience in public procurement practices
7	MKSAMR	- Procurement officer in work group of Building and housing construction - Certified for procurement L and more than 10 years' experience in public procurement practices
8	MKSRIS	- Procurement officer/assistant in work group of Building and housing construction - More than 5 years' experiences in public procurement practices
9	MKSASR	- Procurement officer in work group of Building and housing construction - Certified for procurement L and more than 10 years' experience in public procurement practices
10	MKSROS	- Procurement officer/assistant in work group of Building and housing construction - More than 5 years' experiences in public procurement practices
11	MKSSUR	- Head of the LPSE or Electronic Procurement System Services - Certified for procurement L and more than 5 years' experience in public procurement practices
12	MKSJUS	- Administrator of the e-procurement system (LPSE) - More than 5 years' experience in public procurement practices

13	MKSNIL	- Helpdesk officer of LPSE unit - More than 2 years' experience in public procurement practices
14	MKSRIZ	- Verification officer of LPSE unit - More than 5 years' experience in public procurement practices

List of Benefits Identified from Organisation 3 (NVivo Result)

CODING	MKSSUR	MKSROS	MKSRIZ	MKSRIS	MKSNIL	MKSLIN	MKSLEN	MKSKHA	MKSJUS	MKSFUL	MKSFAR	MKSASR	MKSASD	MKSAMR	**TOTAL**
ACCON	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
AFFIL	0	1	1	1	0	0	1	1	0	1	0	0	0	0	**6**
CORRU	1	1	1	1	1	1	1	0	1	1	1	1	0	1	**12**
EASY	0	0	0	0	0	1	0	0	0	1	1	1	0	1	**5**
EFFEC	1	1	1	1	0	1	0	0	1	1	1	1	0	1	**10**
FAIRC	0	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**
INTER	0	1	0	1	0	1	1	1	1	1	1	1	1	1	**11**
PROTE	0	1	0	0	0	0	1	1	0	0	0	0	0	0	**3**
PUBOP	0	0	0	0	0	1	0	0	0	0	0	0	0	0	**1**
SAVEC	1	1	1	1	1	1	1	0	1	1	1	1	1	1	**13**
SECUR	0	1	0	0	1	0	0	0	0	0	0	0	0	0	**2**
TRANS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**14**
TSAVE	1	0	0	0	1	1	0	0	1	0	1	1	1	1	**8**

List of Costs Identified from Organisation 3 (NVivo Result)

CODING	INFRA	OPMAN	ORGCH	REWRD	TRAIN
MKSSUR	1	1	0	1	1
MKSROS	1	1	0	1	1
MKSRIZ	1	1	0	1	1
MKSRIS	1	1	0	0	1
MKSNIL	1	1	0	0	0
MKSLIN	1	1	0	1	0
MKSLEN	1	1	0	0	0
MKSKHA	1	1	0	0	0
MKSJUS	1	1	0	1	0
MKSFUL	1	1	0	1	1
MKSFAR	1	1	0	0	1
MKSASR	0	1	0	0	1
MKSASD	1	1	1	0	1
MKSAMR	1	1	0	0	1
TOTAL	**13**	**14**	**1**	**6**	**9**

List of Risks Identified from Organisation 3

CODING	FUNDR	HUMER	INTEX	INTFA	LEGAS	ORGRI	READY	SECIN	SYSFA	SYSKN	TSCHE	TURNO
MKSSUR	0	0	0	1	0	0	0	0	1	1	0	0
MKSROS	0	0	1	1	0	0	0	0	1	1	0	0
MKSRIZ	0	0	1	1	1	0	0	0	1	1	0	0
MKSRIS	0	0	0	1	0	0	0	0	1	0	1	0
MKSNIL	0	0	0	1	0	0	0	0	0	1	0	0
MKSLIN	0	0	0	1	0	0	0	0	1	0	0	0
MKSLEN	1	0	0	1	1	0	0	1	0	0	0	0
MKSKHA	0	0	0	1	1	0	0	0	1	1	0	0
MKSJUS	0	0	1	1	1	0	1	0	0	1	0	0
MKSFUL	0	0	0	1	1	0	1	0	1	1	0	1
MKSFAR	1	0	1	1	0	0	0	0	1	1	0	0
MKSASR	0	0	0	1	0	0	0	0	0	1	0	0
MKSASD	0	0	0	1	1	0	0	0	1	0	0	0
MKSAMR	0	1	1	0	1	1	0	1	0	0	0	1
TOTAL	**2**	**1**	**5**	**13**	**7**	**1**	**2**	**2**	**9**	**9**	**1**	**2**

List of E-procurement Success Factors, Organisation 3

CODING	COCOM	COMIT	FUNOP	HRDUG	INVIN	ORGCS	REGLE	SOCIA	TECSD
MKSSUR	0	0	0	1	1	0	0	0	1
MKSROS	0	0	0	1	1	1	0	0	0
MKSRIZ	0	0	1	1	0	0	0	0	0
MKSRIS	0	1	1	1	1	0	0	0	0
MKSNIL	0	0	1	1	0	1	0	0	0
MKSLIN	1	0	0	1	1	1	0	0	0
MKSLEN	0	1	1	1	1	0	0	0	0
MKSKHA	0	0	1	1	0	1	1	0	1
MKSJUS	0	0	1	1	0	1	0	0	0
MKSFUL	0	1	1	0	1	1	0	0	0
MKSFAR	0	1	1	1	1	0	0	0	0
MKSASR	1	1	1	1	1	1	0	0	0
MKSASD	0	0	1	1	1	1	0	0	0
MKSAMR	0	0	1	1	1	1	0	1	1
TOTAL	2	5	11	13	10	9	1	1	3

D5 Case Study: Organisation 4

Details of Interviewees: Case Organisation 4

No.	Interviewee code	Description
1	MJNROS	- Head of the Procurement Unit - Certified for procurement L and 5 years' experience in public procurement practices
2	MJNILH	- Coordinator of construction work group - Certified for procurement L4 and 5 years' experience in public procurement practices
3	MJNAFR	- Secretary of the e-procurement system (LPSE) - More than 3 years' experience in public procurement practices
4	MJNHUS	- Administrator of the e-procurement system (LPSE) - More than 5 years' experience in public procurement practices
5	MJNAKR	- Verification officer of the e-procurement system (LPSE) - More than 5 years of experience in public procurement practices

List of Benefits Identified from Organisation 4

CODING	MJNROS	MJNILH	MJNHUS	MJNAKR	MJNAFR	TOTAL
AFFIL	1	1	1	1	1	**5**
CORRU	1	1	1	1	0	**4**
EASY	1	1	1	1	1	**5**
EFFEC	1	1	0	1	1	**4**
FAIRC	0	1	0	0	0	**1**
INTER	0	1	1	0	1	**3**
PROTE	0	1	0	0	0	**1**
SAVEC	1	1	1	1	1	**5**
SECUR	0	0	0	0	1	**1**
TRANS	0	1	1	1	1	**4**
TSAVE	0	0	1	0	1	**2**

List of Costs Identified from Case Organisation 4

CODING	INFRA	OPMAN	REWRD	SOCIC	TRAIN	**TOTAL**
MJNROS	1	1	1	1	1	**5**
MJNILH	1	1	0	1	0	**3**
MJNHUS	1	1	1	0	1	**4**
MJNAKR	1	0	0	1	1	**3**
MJNAFR	1	1	0	0	0	**2**

List of Risks Identified from Organisation 4

CODING	MJNROS	MJNILH	MJNHUS	MJNAKR	MJNAFR	**TOTAL**
ADAPT	0	0	0	0	1	1
INTEX	0	0	1	0	1	2
INTFA	1	1	0	1	0	3
LEGAS	0	0	0	1	0	1
READY	0	1	1	1	0	3
SECIN	0	0	0	0	1	1
SYSFA	1	1	0	0	1	3
SYSKN	0	1	0	0	1	2
TROUB	0	1	0	0	0	1
TURNO	0	0	0	1	0	1

E-procurement Success Factors, Organisation 4

CODING	MJNROS	MJNILH	MJNHUS	MJNAKR	MJNAFR	**TOTAL**
COCOM	1	0	0	0	1	**2**
COMIT	1	1	1	1	1	**5**
FUNOP	0	1	1	1	0	**3**
HRDUG	1	1	1	0	1	**4**
INVIN	1	1	0	1	1	**4**
ORGCS	1	1	0	1	0	**3**
REGLE	0	0	1	0	0	**1**
SOCIA	0	0	0	1	0	**1**

D6 Case study: Organisation 5 (State-owned University)

Details of Interviewees: Organisation 5, LPSE Unit at State-owned University

No.	Interviewee code	Description
1	UNMKAH	- Head of LPSE Unit - Certified for procurement L4 and more than 10 years of experience in public procurement practices
2	UNMZAI	- Verification officers of LPSE - Certified for procurement L4 and more than 10 years of experience in public procurement practices

List of Benefits Identified from Case Organisation 5

CODING	ACCON	CORRU	EASY	EFFEC	INTER	PUBOP	SAVEC	TRANS
UNMZAI	0	1	1	1	1	0	1	0
UNMKAH	1	1	1	0	1	1	0	1
TOTAL	1	2	2	1	2	1	1	1

List of Costs Identified from Organisation 5

CODING	INFRA	OPMAN
UNMZAI	1	1
UNMKAH	1	1
TOTAL	2	2

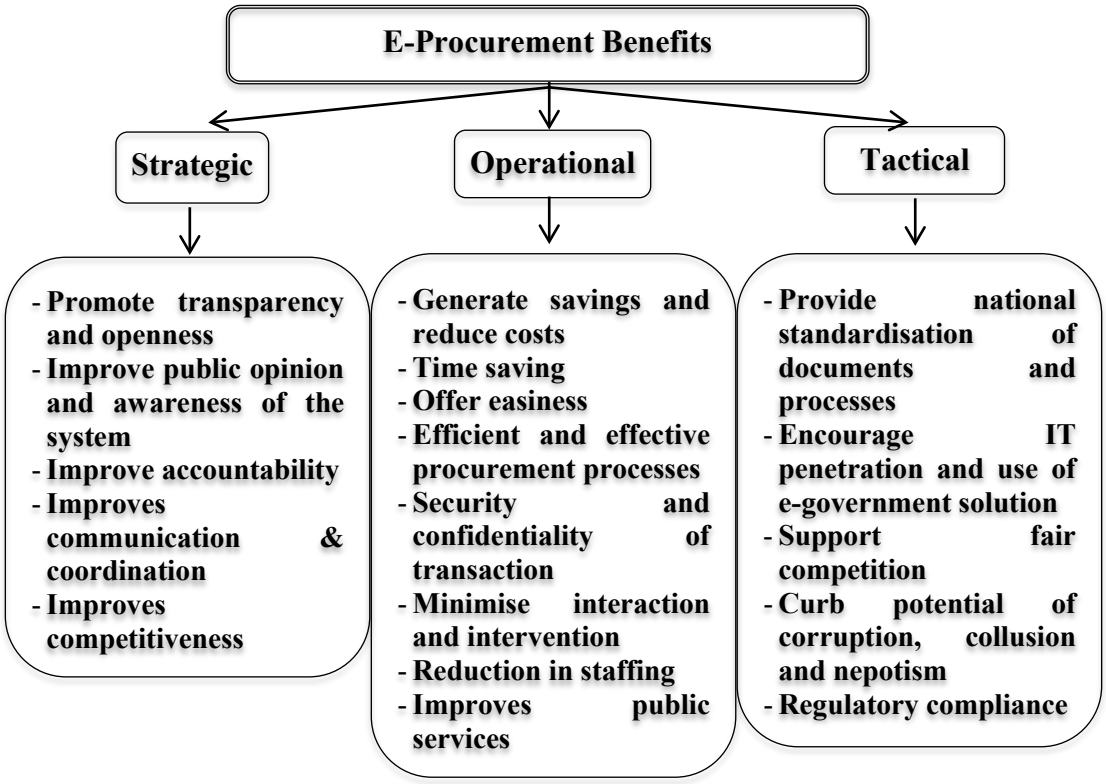
List of Risks Identified from Organisation 5

CODING	UNMZAI	UNMKAH	**TOTAL**
INTFA	1	1	**2**
SECIN	1	1	**2**
SYSFA	1	1	**2**
SYSKN	0	1	**1**

E-procurement Success Factors, Case Organisation 5

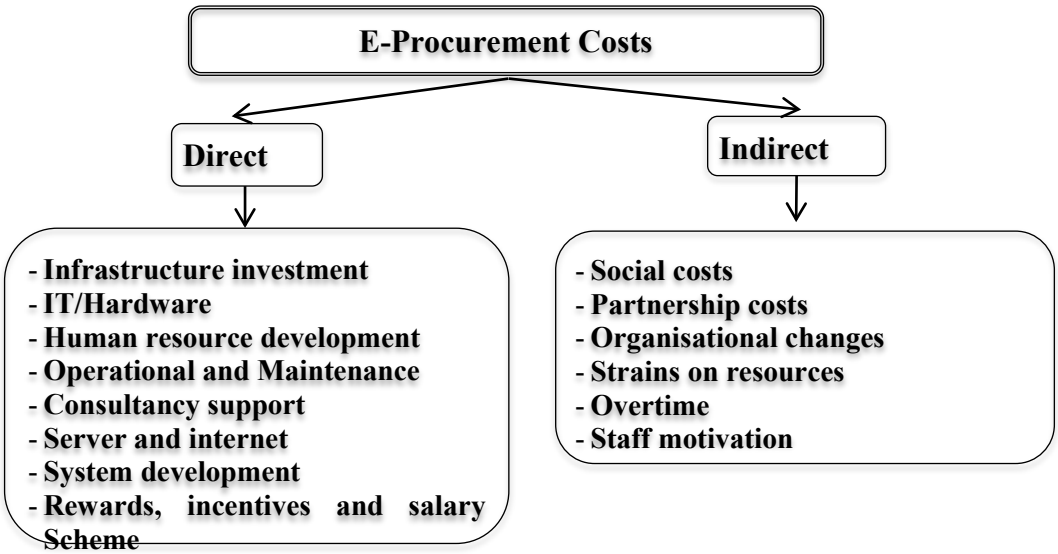
CODING	UNMZAI	UNMKAH	**TOTAL**
COCOM	1	0	**1**
COMIT	1	1	**2**
FUNOP	0	1	**1**
HRDUG	1	1	**2**
INVIN	1	0	**1**
ORGCS	1	1	**2**
REGLE	0	1	**1**
TECSD	1	1	**2**

D7 Cross-case Analysis: E-Procurement Benefits



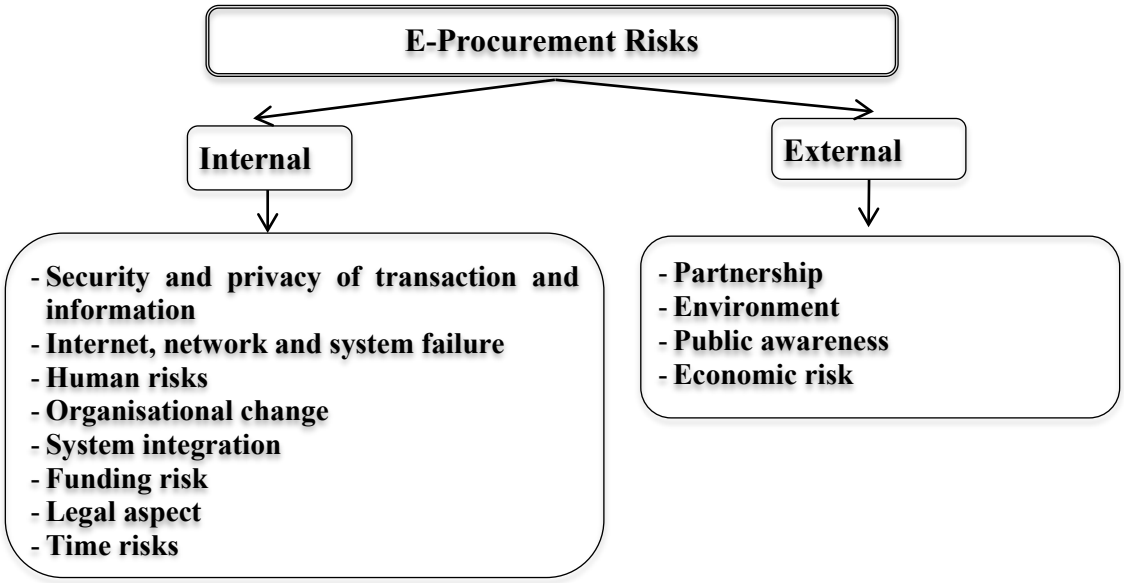
Adjustment to the model for E-Procurement Benefits

D8 Cross-case analysis: E-procurement Costs



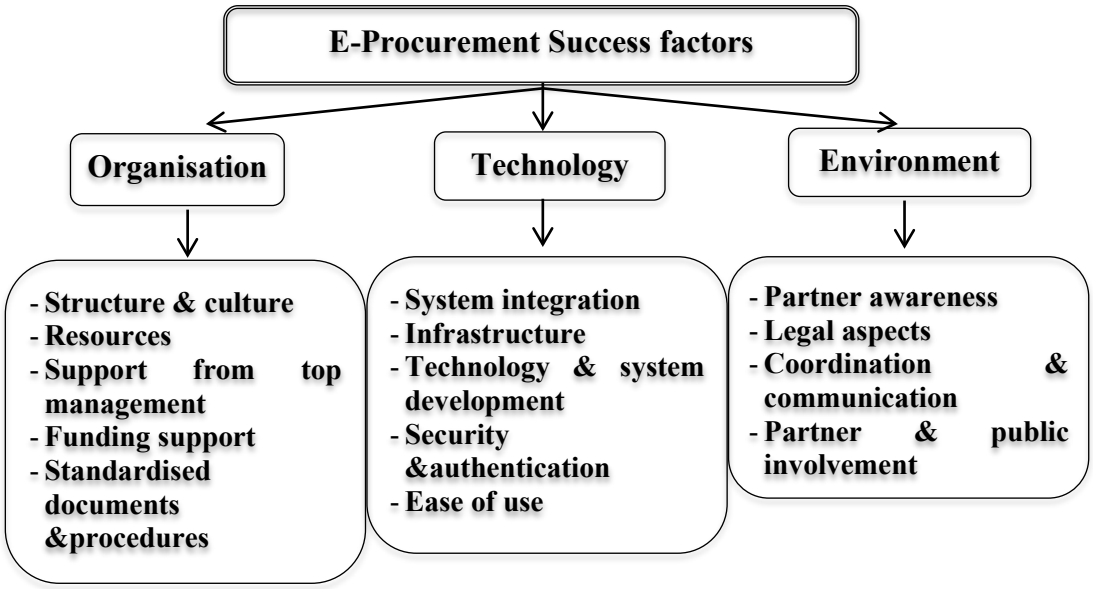
Adjustment to the model for E-Procurement Costs

D9 Cross-case analysis: E-procurement Risks



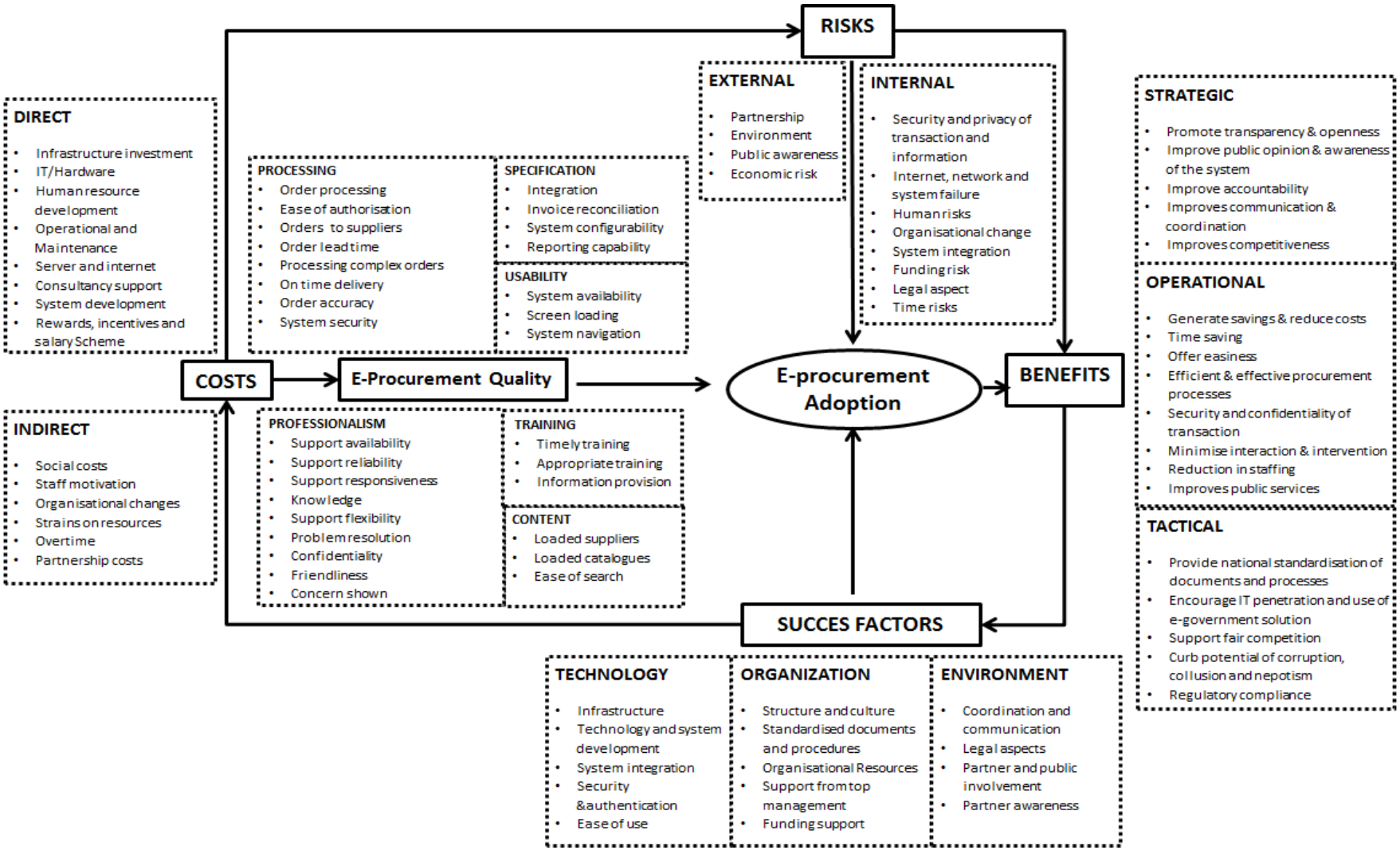
Adjustment to the model for E-Procurement Risks

D10 Cross-case analysis: E-procurement Success Factors



Adjustment to the model for E-procurement Success Factors

D11 Updated framework for successful E-Procurement Adoption



APPENDIX E

E1 The results of the descriptive analysis

	Minimum	Maximum	Mean	Std. Deviation
Benefits				
Transparency	2.00	5.00	4.3687	.68214
Competitiveness	1.00	5.00	4.2442	.72666
Public Opinion	1.00	5.00	4.2488	.73460
Communication and Coordination	1.00	5.00	4.0783	.75052
Accountability	2.00	5.00	4.2396	.67199
Minimise operational cost	1.00	5.00	4.1797	.84435
Reduce cycle time	1.00	5.00	3.9908	.92291
Minimise intervention	1.00	5.00	4.0645	.92069
User Friendly	2.00	5.00	4.1567	.70931
Efficient work flow	1.00	5.00	4.0968	.86326
Security & confidentiality	1.00	5.00	4.1935	.78726
Document standardisation	2.00	5.00	4.1843	.68254
IT penetration	2.00	5.00	4.2673	.70873
Fair competition	2.00	5.00	4.1982	.74684
Curb Corruption	2.00	5.00	4.1982	.75302
Regulatory Compliance	2.00	5.00	4.1521	.72002
Costs				
Infrastructure Investment	1.00	5.00	3.6636	.89867
Human Resource Development	1.00	5.00	3.5300	.99549
Operational & maintenance	1.00	5.00	3.5530	.89142
System development & Upgrade	1.00	5.00	3.5438	.91245
Rewards, incentives & salary	1.00	5.00	3.2074	.92713
Hardware & IT equipment	1.00	5.00	3.5668	.92617
Server & internet connection	2.00	5.00	3.7097	.90959
Consultancy support	1.00	5.00	3.2765	.90628
Social costs	1.00	5.00	3.0553	.92630
Partnership costs	1.00	5.00	2.9908	.96221
Organisational costs	1.00	5.00	2.9724	.92755
Overtime costs	1.00	5.00	2.8986	1.01783
Staff working motivation	1.00	5.00	3.3364	.98235
Strains on resources	1.00	5.00	3.1659	1.00468

Risks				
Security and Privacy risk	1.00	5.00	3.4378	.94626
Internet & network risks	1.00	5.00	3.5115	.93349
Human risks	1.00	5.00	3.3963	.88170
Organisational change risk	1.00	5.00	3.1106	.89584
System integration	1.00	5.00	3.2581	.93182
Funding Risks	1.00	5.00	3.3318	.96252
Time-frame risks	1.00	5.00	3.0369	.96634
Legal aspect risks	1.00	5.00	3.2673	.98248
Partnership/Dependency Risks	1.00	5.00	3.1475	.97487
Environment Risks	1.00	5.00	2.8802	.94987
Public involvement	1.00	5.00	2.8018	.94399
Public Awareness	1.00	5.00	3.0369	.91212
Critical Success Factors				
System Integration & Interoperability	2.00	5.00	3.8710	.81759
Infrastructure investment	2.00	5.00	3.9078	.81694
Technology & System development	2.00	5.00	3.9954	.80793
User Friendly system	2.00	5.00	4.0737	.72909
Security & Authentication	2.00	5.00	4.0461	.77441
Organisational Resource	2.00	5.00	3.8571	.83492
Organisational structure & culture	2.00	5.00	3.8341	.79357
Human Resource Development	2.00	5.00	3.9447	.94118
Commitment & Support from Internal	1.00	5.00	3.9862	.92034
Operational Funding Support	2.00	5.00	3.8387	.94613
Standardise Documents & Procedures	2.00	5.00	3.8618	.78720
Partner/Public Awareness	1.00	5.00	3.7696	.78904
Coordination & Communication	2.00	5.00	3.8571	.77749
Regulatory & Legal aspects	2.00	5.00	3.8894	.77980
Support Central Government	2.00	5.00	3.9862	.83044
E-Procurement Quality				
Support Availability	2.00	5.00	3.9217	.83241
Support Reliability	2.00	5.00	3.8295	.77785
Support Responsiveness	2.00	5.00	3.8433	.78373
Support Knowledge	2.00	5.00	3.8756	.79244
Support Flexibility	2.00	5.00	3.8018	.75914
Problems resolution	2.00	5.00	3.8387	.71801
Confidentiality	2.00	5.00	4.1060	.70238

Friendliness	2.00	5.00	4.0691	.68029
Attitude/Concern shown	1.00	5.00	4.0876	.69833
Order processing Speed	2.00	5.00	3.9539	.74392
Ease of authorisation	2.00	5.00	3.9816	.74513
Orders to suppliers speed	1.00	5.00	3.8894	.79158
Processing complex orders	1.00	5.00	3.7097	.86257
On time delivery	1.00	5.00	3.6912	.85611
Order Accuracy	1.00	5.00	3.7972	.80817
System security	2.00	5.00	4.0461	.75012
Timely Training	1.00	5.00	3.3733	.99248
Appropriate Training	1.00	5.00	3.4977	.94342
Information provision	1.00	5.00	3.6406	.88182
FMS Integration	1.00	5.00	3.3917	.97588
System Configurability	1.00	5.00	3.3733	.89434
Reporting Capability	1.00	5.00	3.7972	.80242
Loaded Suppliers	1.00	5.00	3.6866	.93465
Loaded Catalogues	2.00	5.00	3.5668	.92617
Ease of Search	2.00	5.00	3.9078	.82259
System Availability	2.00	5.00	4.1106	.77980
Screen Loading Speed	2.00	5.00	4.0829	.72171
System Navigation	2.00	5.00	4.1106	.73076
Nature of Use	3.00	5.00	4.4700	.60879
Navigation Patterns	3.00	5.00	4.2120	.63919
Numbers of visits	2.00	5.00	4.1659	.72657
Number of Transactions	2.00	5.00	4.0691	.78753
Valid N = 217 (listwise)				

E2 Missing values

Statistics		
	N	
	Valid	Missing
Transparency	217	0
Competitiveness	217	0
Public Opinion	217	0
Communication and Coordination	217	0
Accountability	217	0
Minimise operational cost	217	0
Reduce cycle time	217	0
Minimise intervention	217	0
User Friendly	217	0
Efficient work flow	217	0
Security & confidentiality	217	0
Document standardisation	217	0
IT penetration	217	0
Fair competition	217	0
Curb Corruption	217	0
Regulatory Compliance	217	0
Infrastructure Investment	217	0
Human Resource Development	217	0
Operational & maintenance	217	0
System development & Upgrade	217	0
Rewards, incentives & salary	217	0
Hardware & IT equipment	217	0
Server & internet connection	217	0
Consultancy support	217	0
Social costs	217	0
Partnership costs	217	0
Organisational costs	217	0
Overtime costs	217	0
Staff working motivation	217	0
Strains on resources	217	0
Security and Privacy risk	217	0
Internet & network risks	217	0
Human risks	217	0
Organisational change risk	217	0
System integration	217	0
Funding Risks	217	0
Time-frame risks	217	0
Legal aspect risks	217	0
Partnership/Dependency Risks	217	0
Environment Risks	217	0
Public involvement	217	0

Public Awareness	217	0
System Integration & Interoperability	217	0
Infrastructure investment	217	0
Technology & System development	217	0
User Friendly system	217	0
Security & Authentication	217	0
Organisational Resource	217	0
Organisational structure & culture	217	0
Human Resource Development	217	0
Commitment & Support from Internal	217	0
Operational Funding Support	217	0
Standardise Documents & Procedures	217	0
Partner/Public Awareness	217	0
Coordination & Communication	217	0
Regulatory & Legal aspects	217	0
Support Central Government	217	0
Support Availability	217	0
Support Reliability	217	0
Support Responsiveness	217	0
Support Knowledge	217	0
Support Flexibility	217	0
Problems resolution	217	0
Confidentiality	217	0
Friendliness	217	0
Attitude/Concern shown	217	0
Order processing Speed	217	0
Ease of authorisation	217	0
Orders to suppliers speed	217	0
Processing complex orders	217	0
On-time delivery	217	0
Order Accuracy	217	0
System security	217	0
Timely Training	217	0
Appropriate Training	217	0
Information provision	217	0
FMS Integration	217	0
System Configurability	217	0
Reporting Capability	217	0
Loaded Suppliers	217	0
Loaded Catalogues	217	0
Ease of Search	217	0
System Availability	217	0
Screen Loading Speed	217	0
System Navigation	217	0
Nature of Use	217	0
Navigation Patterns	217	0

Numbers of visits	217	0
Number of Transactions	217	0

E3 Outliers

Table of Z-Scores

Descriptive Statistics			
	N	**Minimum**	**Maximum**
Zscore: Tranparency	217	-3.47242	.92553
Zscore: Competitiveness	217	-4.46459	1.04005
Zscore: Public Opinion	217	-4.42260	1.02253
Zscore: Communication and Coordination	217	-4.10162	1.22803
Zscore: Accountability	217	-3.33284	1.13152
Zscore: Minimise operational cost	217	-3.76590	.97149
Zscore: Reduce cycle time	217	-3.24059	1.09351
Zscore: Minimise intervention	217	-3.32850	1.01607
Zscore: User Friendly	217	-3.04055	1.18893
Zscore: Efficient work flow	217	-3.58729	1.04629
Zscore: Security & confidentiality	217	-4.05655	1.02438
Zscore: Document standardisation	217	-3.20029	1.19504
Zscore: IT penetration	217	-3.19906	1.03384
Zscore: Fair competition	217	-2.94327	1.07364
Zscore: Curb Corruption	217	-2.91914	1.06484
Zscore: Regulatory Compliance	217	-2.98890	1.17764
Zscore: Infrastructure Investment	217	-2.96394	1.48710
Zscore: Human Resource Development	217	-2.54142	1.47671
Zscore: Operational & maintenance	217	-2.86396	1.62326
Zscore: System development & Upgrade	217	-2.78786	1.59595
Zscore: Rewards, incentives & salary	217	-2.38086	1.93352
Zscore: Hardware & IT equipment	217	-2.77145	1.54743
Zscore: Server & internet connection	217	-1.87961	1.41857
Zscore: Consultancy support	217	-2.51191	1.90173
Zscore: Social costs	217	-2.21882	2.09942
Zscore: Partnership costs	217	-2.06898	2.08814
Zscore: Organisational costs	217	-2.12642	2.18604
Zscore: Overtime costs	217	-1.86537	2.06458
Zscore: Staff working motivation	217	-2.37838	1.69348
Zscore: Strains on resources	217	-2.15580	1.82555
Zscore: Security and Privacy risk	217	-2.57622	1.65092
Zscore: Internet & network risks	217	-2.69048	1.59454
Zscore: Human risks	217	-2.71783	1.81886
Zscore: Organisational change risk	217	-2.35600	2.10909
Zscore: System integration	217	-2.42330	1.86940
Zscore: Funding Risks	217	-2.42261	1.73317
Zscore: Time-frame risks	217	-2.10781	2.03151
Zscore: Legal aspect risks	217	-2.30771	1.76362
Zscore: Partnership/Dependency Risks	217	-2.20282	1.90028
Zscore: Environment Risks	217	-1.97942	2.23170

Zscore: Public involvement	217	-1.90876	2.32859
Zscore: Public Awareness	217	-2.23311	2.15227
Zscore: System Integration & Interoperability	217	-2.28838	1.38092
Zscore: Infrastructure investment	217	-2.33534	1.33690
Zscore: Technology & System development	217	-2.46975	1.24343
Zscore: User Friendly system	217	-2.84427	1.27044
Zscore: Security & Authetication	217	-2.64210	1.23179
Zscore: Organisational Resource	217	-2.22434	1.36882
Zscore: Organisational structure & culture	217	-2.31120	1.46918
Zscore: Human Resource Development	217	-2.06624	1.12125
Zscore: Commitment & Support from Internal	217	-3.24463	1.10157
Zscore: Operational Funding Support	217	-1.94340	1.22741
Zscore: Standardise Documents & Procedures	217	-2.36502	1.44594
Zscore: Partner/Public Awareness	217	-3.51006	1.55938
Zscore: Coordination & Communication	217	-2.38863	1.46992
Zscore: Regulatory & Legal aspects	217	-2.42294	1.42422
Zscore: Support Central Government	217	-2.39173	1.22084
Zscore: Support Availability	217	-2.30855	1.29544
Zscore: Support Reliability	217	-2.35198	1.50480
Zscore: Support Responsiveness	217	-2.35199	1.47588
Zscore: Support Knowledge	217	-2.36683	1.41893
Zscore: Support Flexibility	217	-2.37353	1.57831
Zscore: Problems resolution	217	-2.56086	1.61738
Zscore: Confidentiality	217	-2.99835	1.27282
Zscore: Friendliness	217	-3.04154	1.36835
Zscore: Attitude/Concern shown	217	-4.42133	1.30660
Zscore: Order processing Speed	217	-2.62650	1.40617
Zscore: Ease of authorisation	217	-2.65937	1.36679
Zscore: Orders to suppliers speed	217	-3.65017	1.40301
Zscore: Processing complex orders	217	-3.14140	1.49591
Zscore: Ontimr delivery	217	-3.14356	1.52872
Zscore: Order Accuracy	217	-3.46119	1.48826
Zscore: System security	217	-2.72767	1.27168
Zscore: Timely Training	217	-2.39125	1.63905
Zscore: Appropriate Training	217	-2.64749	1.59240
Zscore: Information provision	217	-2.99443	1.54164
Zscore: FMS Integration	217	-2.45082	1.64805
Zscore: System Configurability	217	-2.65367	1.81892
Zscore: Reporting Capability	217	-3.48599	1.49892
Zscore: Loaded Suppliers	217	-2.87448	1.40519
Zscore: Loaded Catalogues	217	-1.69173	1.54743
Zscore: Ease of Search	217	-2.31931	1.32772
Zscore: System Availability	217	-2.70660	1.14056
Zscore: Screen Loading Speed	217	-2.88613	1.27066
Zscore: System Navigation	217	-2.88823	1.21709
Zscore: Nature of Use	217	-2.41470	.87050

Zscore: Navigation Patterns	217	-1.89613	1.23285
Zscore: Numbers of visits	217	-2.98099	1.14800
Zscore: Number of Transactions	217	-2.62737	1.18202
Valid N (listwise)	217		

E4 Confirmation to Normality

The result for the Skewness and Kurtosis (Confirmation to normality)

Descriptive Statistics				
	Mean	**Std. Deviation**	**Skewness**	**Kurtosis**
Benefits				
Transparency	4.3687	.68214	-.795	.205
Competitiveness	4.2442	.72666	-.995	1.828
Public Opinion	4.2488	.73460	-.924	1.402
Communication and Coordination	4.0783	.75052	-.726	1.025
Accountability	4.2396	.67199	-.510	.025
Minimise operational cost	4.1797	.84435	-1.143	1.761
Reduce cycle time	3.9908	.92291	-.980	1.274
Minimise intervention	4.0645	.92069	-1.063	.994
User Friendly	4.1567	.70931	-.392	-.398
Efficient work flow	4.0968	.86326	-1.191	2.215
Security & confidentiality	4.1935	.78726	-.817	.646
Document standardisation	4.1843	.68254	-.338	-.494
IT penetration	4.2673	.70873	-.593	-.238
Fair competition	4.1982	.74684	-.475	-.628
Curb Corruption	4.1982	.75302	-.542	-.421
Regulatory Compliance	4.1521	.72002	-.386	-.490
Costs				
Infrastructure Investment	3.6636	.89867	-.442	.004
Human Resource Development	3.5300	.99549	-.311	-.656
Operational & maintenance	3.5530	.89142	-.260	-.494
System development & Upgrade	3.5438	.91245	-.186	-.599
Rewards, incentives & salary	3.2074	.92713	.103	-.567
Hardware & IT equipment	3.5668	.92617	-.374	-.431
Server & internet connection	3.7097	.90959	-.360	-.611
Consultancy support	3.2765	.90628	-.049	-.333
Social costs	3.0553	.92630	-.075	-.369
Partnership costs	2.9908	.96221	-.044	-.468
Organisational costs	2.9724	.92755	-.050	-.237
Overtime costs	2.8986	1.01783	-.061	-.636
Staff working motivation	3.3364	.98235	-.185	-.735
Strains on resources	3.1659	1.00468	-.256	-.591
Risks				
Security and Privacy risk	3.4378	.94626	-.481	-.042
Internet & network risks	3.5115	.93349	-.223	-.395
Human risks	3.3963	.88170	-.212	-.271
Organisational change risk	3.1106	.89584	.170	.030
System integration	3.2581	.93182	-.052	-.369
Funding Risks	3.3318	.96252	-.111	-.462

Time-frame risks	3.0369	.96634	-.012	-.243
Legal aspect risks	3.2673	.98248	.181	-.660
Partnership/Dependency Risks	3.1475	.97487	-.028	-.605
Environment Risks	2.8802	.94987	.209	-.402
Public involvement	2.8018	.94399	.273	-.151
Public Awareness	3.0369	.91212	.075	-.176
Critical Success Factors				
System Integration & Interoperability	3.8710	.81759	-.424	-.231
Infrastructure investment	3.9078	.81694	-.394	-.331
Technology & System development	3.9954	.80793	-.523	-.139
User Friendly system	4.0737	.72909	-.548	.288
Security & Authetication	4.0461	.77441	-.382	-.457
Organisational Resource	3.8571	.83492	-.496	-.171
Organisational structure & culture	3.8341	.79357	-.255	-.387
Human Resource Development	3.9447	.94118	-.629	-.448
Commitment & Support from Internal	3.9862	.92034	-.656	-.198
Operational Funding Support	3.8387	.94613	-.466	-.653
Standardise Documents & Procedures	3.8618	.78720	-.267	-.375
Partner/Public Awareness	3.7696	.78904	-.422	.220
Coordination & Communication	3.8571	.77749	-.402	-.074
Regulatory & Legal aspects	3.8894	.77980	-.159	-.607
Support Central Government	3.9862	.83044	-.366	-.616
E-Procurement Quality				
Support Availability	3.9217	.83241	-.678	.163
Support Reliability	3.8295	.77785	-.467	.051
Support Responsiveness	3.8433	.78373	-.299	-.279
Support Knowledge	3.8756	.79244	-.394	-.176
Support Flexibility	3.8018	.75914	-.356	-.048
Problems resolution	3.8387	.71801	-.432	.278
Confidentiality	4.1060	.70238	-.393	-.106
Friendliness	4.0691	.68029	-.264	-.218
Attitude/Concern shown	4.0876	.69833	-.697	1.520
Order processing Speed	3.9539	.74392	-.062	-.843
Ease of authorisation	3.9816	.74513	-.174	-.655
Orders to suppliers speed	3.8894	.79158	-.196	-.292
Processing complex orders	3.7097	.86257	-.362	.178
Ontime delivery	3.6912	.85611	-.298	.158
Order Accuracy	3.7972	.80817	-.092	-.382
System security	4.0461	.75012	-.341	-.424
Timely Training	3.3733	.99248	-.003	-.738
Appropriate Training	3.4977	.94342	-.110	-.744

Information provision	3.6406	.88182	-.087	-.525
FMS Integration	3.3917	.97588	-.311	-.285
System Configurability	3.3733	.89434	-.142	-.164
Reporting Capability	3.7972	.80242	-.647	1.037
Loaded Suppliers	3.6866	.93465	-.263	-.627
Loaded Catalogues	3.5668	.92617	-.056	-.835
Ease of Search	3.9078	.82259	-.331	-.485
System Availability	4.1106	.77980	-.610	-.008
Screen Loading Speed	4.0829	.72171	-.350	-.328
System Navigation	4.1106	.73076	-.318	-.617
Nature of Use	4.4700	.60879	-.692	-.473
Navigation Patterns	4.2120	.63919	-.218	-.644
Numbers of visits	4.1659	.72657	-.411	-.525
Number of Transactions	4.0691	.78753	-.410	-.530
Valid N = 217 (listwise)				

E5 Non-response Bias Test

The result for Non-response bias test

Phase	Activity	Periods	Number Responses	Percentage of Total returned	Percentage from email sent (513)
1	First e-mail	01/09/2014 – 13/10/2014 (6 weeks)	192	88.48	37.43
2	Reminder and Final Reminder e-mail	14/10/2014 – 18/11/2014 (6 weeks)	25	11.52	4.87
Total			**217**	**100**	**42.30**

E6 Independent Samples T-Test

Group statistic for Independent samples T-Test

Group Statistics					
	Group	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Working experience	Phase 1	192	2.9271	.74840	.05401
	Phase 2	25	2.8800	.78102	.15620
Position	Phase 1	192	4.0469	2.19778	.15861
	Phase 2	25	4.8400	3.73809	.74762
Transparency (Benefit)	Phase 1	192	4.3646	.68062	.04912
	Phase 2	25	4.4000	.70711	.14142
Infrastructure Investment (Cost)	Phase 1	192	3.6198	.87203	.06293
	Phase 2	25	4.0000	1.04083	.20817
Security and Privacy (Risk)	Phase 1	192	3.4531	.95330	.06880
	Phase 2	25	3.3200	.90000	.18000
System integrity and operability (Success Factors)	Phase 1	192	3.9063	.81322	.05869
	Phase 2	25	3.6000	.81650	.16330
Support Availabilty (Professionalism)	Phase 1	192	3.9271	.85913	.06200
	Phase 2	25	3.8800	.60000	.12000
Nature of Use (Adoption)	Phase 1	192	4.4635	.61288	.04423
	Phase 2	25	4.5200	.58595	.11719

Notably the difference between the phase 1 and phase 2 samples are not significant (see column mean difference in the following table).

The results for Independent samples T-Test for Phase 1 and Phase 2 samples

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Working experience	Equal variances assumed	.331	.566	.294	215	.769	.04708	.15992
	Equal variances not assumed			.285	30.028	.778	.04708	.16528
Position	Equal variances assumed	21.769	.000	.294	215	.769	.04708	.15992
	Equal variances not assumed			.285	30.028	.778	.04708	.16528
Transparency (Benefit)	Equal variances assumed	.146	.703	-.244	215	.808	-.03542	.14535
	Equal variances not assumed			-.237	30.085	.815	-.03542	.14971
Infrastructure Investment (Cost)	Equal variances assumed	.007	.936	-2.004	215	.046	-.38021	.18976
	Equal variances not assumed			-1.748	28.558	.091	-.38021	.21747
Security and Privacy (Risk)	Equal variances assumed	.376	.540	.661	215	.509	.13313	.20146
	Equal variances not assumed			.691	31.440	.495	.13313	.19270
System integrity and operability (Success Factors)	Equal variances assumed	.356	.551	1.770	215	.078	.30625	.17299
	Equal variances not assumed			1.765	30.536	.088	.30625	.17353
Support Availabilty (Professionalism)	Equal variances assumed	3.957	.048	.265	215	.791	.04708	.17737
	Equal variances not assumed			.349	38.183	.729	.04708	.13507
Nature of Use (Adoption)	Equal variances assumed	.294	.588	-.435	215	.664	-.05646	.12969
	Equal variances not assumed			-.451	31.245	.655	-.05646	.12526

E7 Mann-Whitney U-Tests

The Group statistic for Mann-Whitney U-Tests

Ranks				
	Group	**N**	**Mean Rank**	**Sum of Ranks**
Working experience	Phase 1	192	109.23	20972.00
	Phase 2	25	107.24	2681.00
	Total	217		
Position	Phase 1	192	109.13	20953.00
	Phase 2	25	108.00	2700.00
	Total	217		
Transparency (Benefit)	Phase 1	192	108.56	20843.50
	Phase 2	25	112.38	2809.50
	Total	217		
Infrastructure Investment (Cost)	Phase 1	192	105.70	20294.00
	Phase 2	25	134.36	3359.00
	Total	217		
Security and Privacy (Risk)	Phase 1	192	109.97	21114.00
	Phase 2	25	101.56	2539.00
	Total	217		
System integrity and operability (Success Factors)	Phase 1	192	111.38	21385.00
	Phase 2	25	90.72	2268.00
	Total	217		
Support Availabilty (Professionalism)	Phase 1	192	109.82	21086.00
	Phase 2	25	102.68	2567.00
	Total	217		
Nature of Use (Adoption)	Phase 1	192	108.47	20826.00
	Phase 2	25	113.08	2827.00
	Total	217		

From the table the difference between the group phase 1 and phase 2 can be seen in the column 5 (Asymp Sig 2-tailed) and column 6 (Exact Sig 2-tailed). The deviation between the two group is shown in the point probability column in which the difference were not significant between 2 groups.

The results of Mann-Whitney U-Tests for Phase 1 and Phase 2 samples

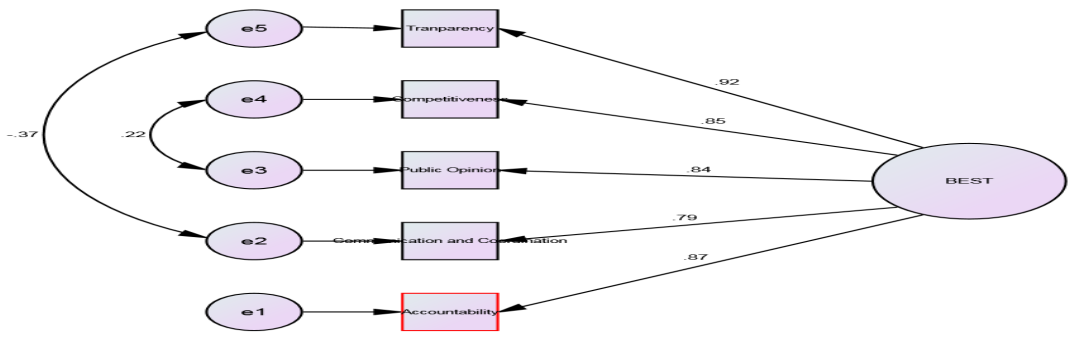
	Mann-Whitney U	**Wilcoxon W**	**Z**	**Asymp. Sig. (2-tailed)**	**Exact Sig. (2-tailed)**	**Point Probability**	**Significance**
Working experience	2356.000	2681.000	-0.167	0.868	0.870	0.008	No
Position	2375.000	2700.000	-0.090	0.928	0.930	0.001	No
Transparency (Benefit)	2315.500	20843.500	-0.317	0.751	0.744	0.003	No
Infrastructure Investment (Cost)	1766.000	20294.000	-2.285	0.022	0.021	0.000	No
Security and Privacy (Risk)	2214.000	2539.000	-0.668	0.504	0.508	0.004	No
System integrity and operability (Success Factors)	1943.000	2268.000	-1.674	0.094	0.103	0.002	No
Support Availabilty (Professionalism)	2242.000	2567.000	-0.588	0.556	0.564	0.001	No
Nature of Use (Adoption)	2298.000	20826.000	-0.391	0.696	0.771	0.072	No

E8 Measurement Model Analysis "Strategic Benefits"

Good Fit Indices for Measurement Model of "Strategic Benefits"

	Estimate	**p-value**	**Goodness-of-Fit Indices**
BESTE<--- Strategic Benefits	.869	***	X^2 = 17.439; P = .004; CMIN/DF = 3.488; GFI = .970 ; AGFI = .910; CFI = .986; NFI = .980; TLI = .971; RMSEA= .107
BESTD<--- Strategic Benefits	.759	***	
BESTC<--- Strategic Benefits	.864	***	
BESTB<--- Strategic Benefits	.881	***	
BESTA<--- Strategic Benefits	.893	***	

Modified Model for "Strategic Benefits



Modified Model for "Strategic Benefits"

Good Fit Indices of Modified Model Analysis for "Strategic Benefits"

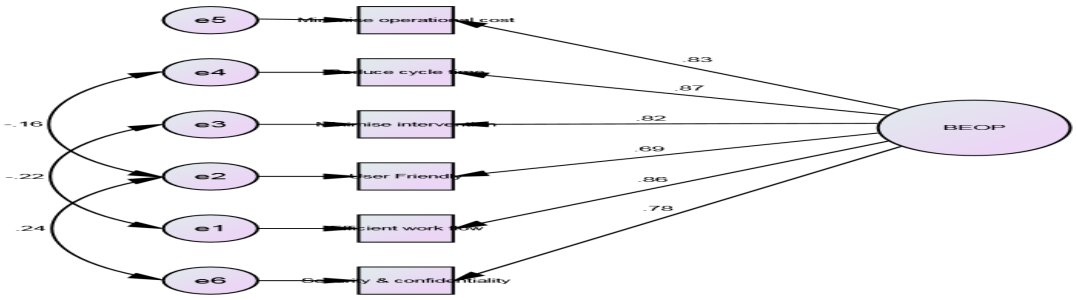
	Estimate	p-value	Goodness-of-Fit Indices
BESTE<--- Strategic Benefits	.871	***	X^2 = 3.807 ; P = .283; CMIN/DF = 1.269; GFI = .993 ; AGFI = .965; CFI = .999; NFI = .996; TLI = .997; RMSEA= .035
BESTD<--- Strategic Benefits	.794	***	
BESTC<--- Strategic Benefits	.839	***	
BESTB<--- Strategic Benefits	.855	***	
BESTA<--- Strategic Benefits	.918	***	

E9 Measurement Model Analysis of "Operational Benefits"

Good Fit Indices of Measurement Model for "Operational Benefits"

	Estimate	p-value	Goodness-of-Fit Indices
BEOPE<--- Operational Benefits	.845	***	X^2 = 27.177 ; P = .001; CMIN/DF = 3.020; GFI = .959 ; AGFI = .905; CFI = .979 ; NFI = .969; TLI = .965 ; RMSEA= .097
BEOPD<--- Operational Benefits	.696	***	
BEOPC<--- Operational Benefits	.800	***	
BEOPB<--- Operational Benefits	.868	***	
BEOPA<--- Operational Benefits	.830	***	

Modified Model for "Operational Benefits"



Modified Model for "Operational Benefits"

Good Fit Indices for Modified Model "Operational Benefits"

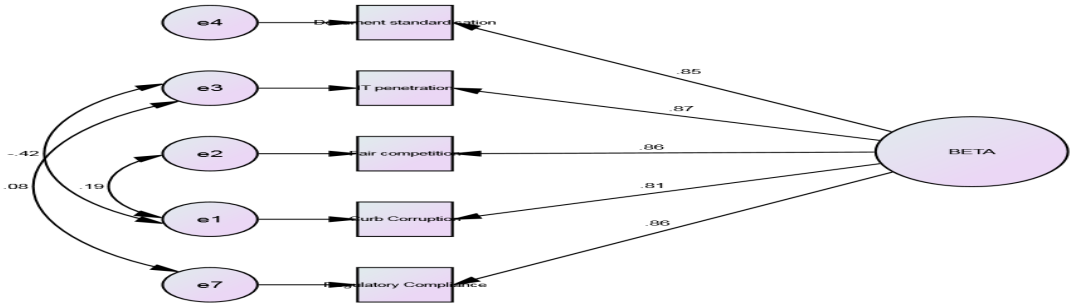
	Estimate	p-value	Goodness-of-Fit Indices
BEOPE<--- Operational Benefits	.860	***	X^2 = 4.527; P = .606; CMIN/DF = .755; GFI = .993; AGFI = .976; CFI = 1.000 ; NFI = .995; TLI = 1.004 ; RMSEA= .000
BEOPD<--- Operational Benefits	.692	***	
BEOPC<--- Operational Benefits	.817	***	
BEOPB<--- Operational Benefits	.874	***	
BEOPA<--- Operational Benefits	.825	***	

E10 Measurement Model Analysis "Tactical Benefits"

Good Fit Indices of Measurement Model for "Tactical Benefits"

	Estimate	p-value	Goodness-of-Fit Indices
BETAD<--- Tactical Benefits	.798	***	X^2 = 40.999; P = .000; CMIN/DF = 8.200; GFI = .936; AGFI = .899; CFI = .979 ; NFI = .952; TLI = .915 ; RMSEA= .183
BETAC<--- Tactical Benefits	.885	***	
BETAB<--- Tactical Benefits	.841	***	
BETAA<--- Tactical Benefits	.844	***	
BETAE<--- Tactical Benefits	.876	***	

Modified Model for "Tactical Benefits"



Modified Model for "Tactical Benefits"

Good Fit Indices of Modified Model for "Tactical Benefits"

	Estimate	p-value	Goodness-of-Fit Indices
BETAD<--- Tactical Benefits	.813	***	X^2 = 2.016; P = .365 CMIN/DF = 1.008; GFI = .996; AGFI = .972; CFI = 1.000; NFI = .998; TLI =1.000; RMSEA= .006
BETAC<--- Tactical Benefits	.864	***	
BETAB<--- Tactical Benefits	.865	***	
BETAA<--- Tactical Benefits	.849	***	
BETAE<--- Tactical Benefits	.865	***	

E11 First-Order CFA 'Benefits'

GFIs for First-Order CFA 'Benefits'

	Estimate	p-value	Goodness-of-Fit Indices
BESTE <--- Strategic Benefits	.864	***	X^2 = 290.725; P = .000;CMIN/DF = 2.878; GFI = .853; AGFI = .801; CFI = .938 ; NFI = .909 TLI = .927; RMSEA= .093; Standardized RMR = .0414
BESTD <--- Strategic Benefits	.760	***	
BESTC <--- Strategic Benefits	.870	***	
BESTB <--- Strategic Benefits	.882	***	
BESTA <--- Strategic Benefits	.890	***	
BEOPE <--- Operational Benefits	.844	***	
BEOPD <--- Operational Benefits	.713	***	
BEOPC <--- Operational Benefits	.807	***	
BEOPB <--- Operational Benefits	.853	***	
BEOPA <--- Operational Benefits	.818	***	
BEOPF <--- Operational Benefits	.813	***	
BETAD <--- Tactical Benefits	.808	***	
BETAC <--- Tactical Benefits	.886	***	
BETAB <--- Tactical Benefits	.830	***	
BETAA <--- Tactical Benefits	.844	***	
BETAE <--- Tactical Benefits	.876	***	

Modified Model of First-Order CFA 'Benefits'

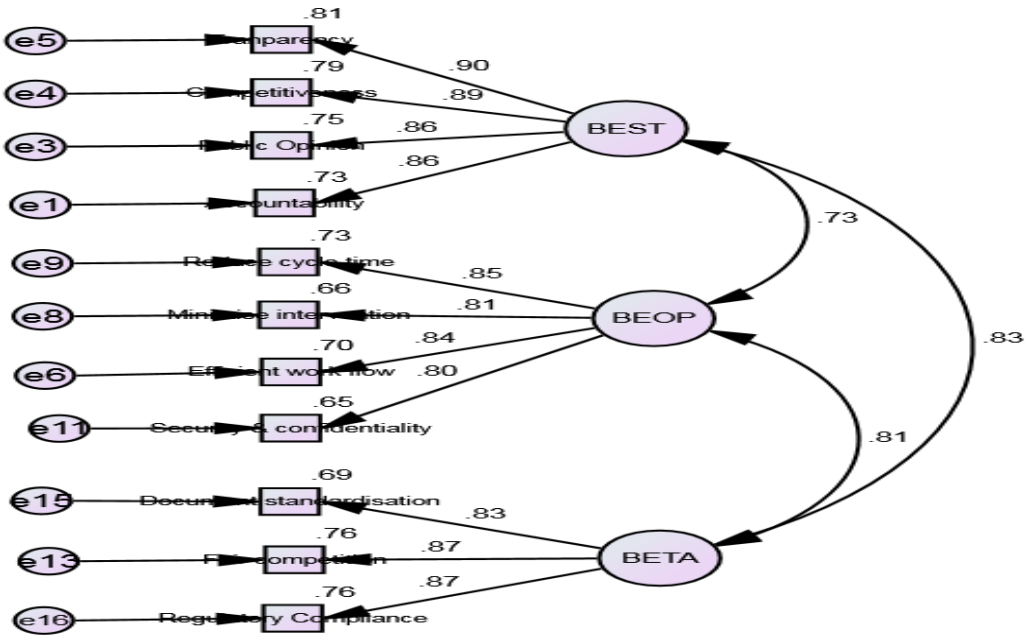


Figure. First-Order CFA for Modified Measurement Model of 'Benefits'

GFIs for First-Order CFA for Modified 'Benefits'

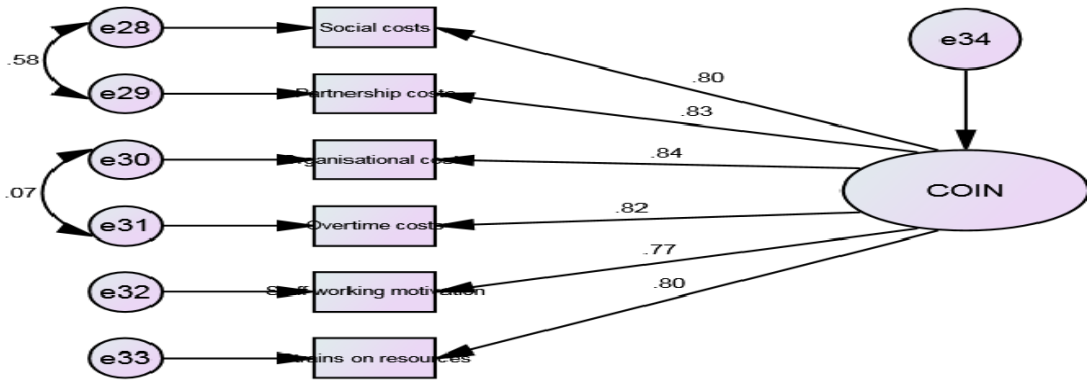
	Estimate	p-value	Goodness-of-Fit Indices
BESTE <--- Strategic Benefits	.857	***	X^2 = 80.115; P = .000; CMIN/DF = 1.954; GFI = .938; AGFI = .900; CFI = .980; NFI = .960; TLI = .973 ; RMSEA= .066; Standardized RMR = .0277 Deleted items : BEOPA BEOPD BESTD BETAB BETAD
BESTC <--- Strategic Benefits	.864	***	
BESTB <--- Strategic Benefits	.887	***	
BESTA <--- Strategic Benefits	.897	***	
BEOPE <--- Operational Benefits	.837	***	
BEOPC <--- Operational Benefits	.811	***	
BEOPB <--- Operational Benefits	.855	***	
BEOPF <--- Operational Benefits	.804	***	
BETAC <--- Tactical Benefits	.874	***	
BETAA <--- Tactical Benefits	.833	***	
BETAE <--- Tactical Benefits	.871	***	

E12 Measurement Model Analysis for "Indirect Costs"

Good Fit Indices Measurement Model Analysis for "Indirect Costs"

	Estimate	p-value	Goodness-of-Fit Indices
COINF<--- Indirect Costs	.759	***	X^2 = 72.567; P = .000 CMIN/DF = 8.063 GFI = .884; AGFI = .729; CFI = .934; NFI = .980; TLI = .890; RMSEA= .181
COINE<--- Indirect Costs	.730	***	
COIND<--- Indirect Costs	.790	***	
COINC<--- Indirect Costs	.828	***	
COINB<--- Indirect Costs	.900	***	
COINA<--- Indirect Costs	.882	***	

Modified Measurement Model for "Indirect Costs"



Modified Measurement Model for "Indirect Costs"

Good Fit Indices for Modified Measurement Model "Indirect Costs"

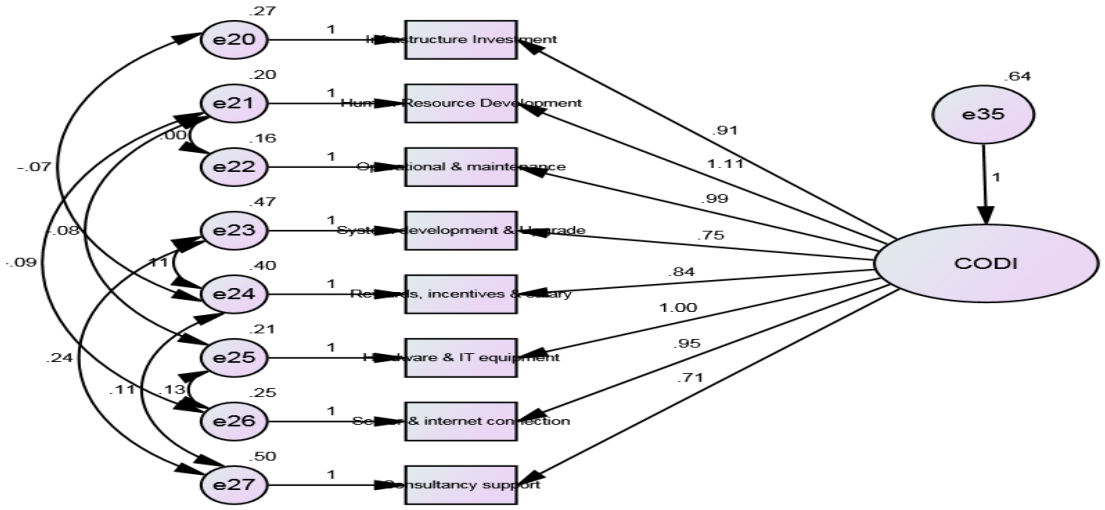
	Estimate	p-value	Goodness-of-Fit Indices
COINF<--- Indirect Costs	.804	***	X^2 = 16.675; P = .020; CMIN/DF = 2.382; GFI = .974; AGFI = .921; CFI = .990; NFI = .983; TLI = .979; RMSEA= .080
COINE<--- Indirect Costs	.768	***	
COIND<--- Indirect Costs	.823	***	
COINC<--- Indirect Costs	.836	***	
COINB<--- Indirect Costs	.826	***	
COINA<--- Indirect Costs	.802	***	

E13 Measurement Model Analysis for "Direct Costs"

Good Fit Indices measurement Model for "Direct Costs"

	Estimate	p-value	Goodness-of-Fit Indices
CODIF<--- Direct Costs	.891	***	X2 = 200.722; P = .000; CMIN/DF = 10.036; GFI = .802; AGFI =.644; CFI = .873; NFI = .862; TLI = .823; RMSEA= .205
CODIE<--- Direct Costs	.732	***	
CODID<--- Direct Costs	.693	***	
CODIC<--- Direct Costs	.890	***	
CODIB<--- Direct Costs	.834	***	
CODIA<--- Direct Costs	.797	***	
CODIG<--- Direct Costs	.865	***	
CODIH<--- Direct Costs	.661	***	

Modified Model for "Direct Costs



Modified Model for "Direct Costs"

Good Fit Indices for Modified Model "Direct Costs"

	Estimate	p-value	Goodness-of-Fit Indices
CODIF<--- Direct Costs	.867	***	X^2 = 15.985; P = .192; CMIN/DF = 1.332; GFI = .983; AGFI =.948; CFI = .997; NFI = .989; TLI = .993; RMSEA= .039
CODIE<--- Direct Costs	.730	***	
CODID<--- Direct Costs	.656	***	
CODIC<--- Direct Costs	.893	***	
CODIB<--- Direct Costs	.895	***	
CODIA<--- Direct Costs	.811	***	
CODIG<--- Direct Costs	.837	***	
CODIH<--- Direct Costs	.626	***	

E14 First-Order CFA of 'Costs'

GFIs for First-Order CFA of 'Costs'

	Estimate	p-value	Goodness-of-Fit Indices
CODIF<--- Direct Costs	.885	***	X^2 = 405.640; P = .000; CMIN/DF = 5.337; GFI = .769; AGFI =.680; CFI = .874; NFI = .850; TLI = .849; RMSEA= .142; Standardized RMR = .0693
CODIE<--- Direct Costs	.740	***	
CODID<--- Direct Costs	.707	***	
CODIC<--- Direct Costs	.888	***	
CODIB<--- Direct Costs	.833	***	
CODIA<--- Direct Costs	.791	***	
CODIG<--- Direct Costs	.861	***	
CODIH<--- Direct Costs	.678	***	
COINF<--- Indirect Costs	.758	***	
COINE<--- Indirect Costs	.735	***	
COIND<--- Indirect Costs	.789	***	
COINC<--- Indirect Costs	.836	***	
COINB<--- Indirect Costs	.893	***	
COINA<--- Indirect Costs	.882	***	

GFIs of First-Order CFA for Modified Model of 'Costs'

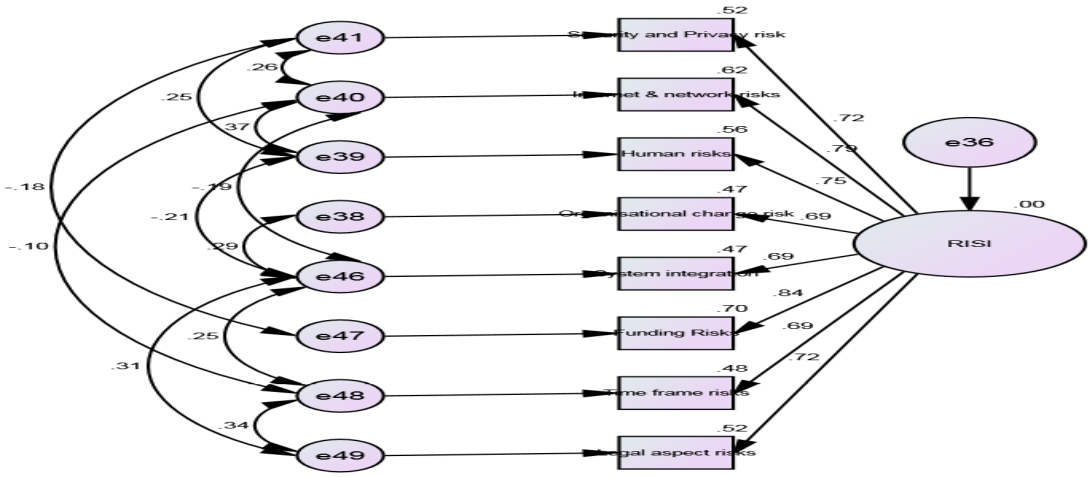
	Estimate	p-value	Goodness-of-Fit Indices
CODIF<--- Direct Costs	.949	***	X^2 = 20.077; P = .010; CMIN/DF = 2.510; GFI = .972; AGFI =.927; CFI = .988; NFI = .981; TLI = .978; RMSEA= .084; Standardized RMR = .0408 Deleted items : CODIB, CODIC, CODID, CODIE, CODIH, COIND, COINE, COINF
CODIA<--- Direct Costs	.742	***	
CODIG<--- Direct Costs	.930	***	
COINC<--- Indirect Costs	.784	***	
COINB<--- Indirect Costs	.917	***	
COINA<--- Indirect Costs	.931	***	

E15 Measurement Model Analysis for "Internal Risks"

Good Fit Indices Measurement Model Analysis for "Internal Risks"

	Estimate	p-value	Goodness-of-Fit Indices
RISID <--- Internal Risk	.707	***	X^2 = 158.804; P = .000; CMIN/DF = 7.940; GFI = .814; AGFI =.665; CFI = .868; NFI = .853; TLI = .815; RMSEA= .179;
RISIC <--- Internal Risk	.771	***	
RISIB <--- Internal Risk	.795	***	
RISIA <--- Internal Risk	.746	***	
RISIE<--- Internal Risk	.702	***	
RISIF<--- Internal Risk	.797	***	
RISIG <--- Internal Risk	.725	***	
RISIH <--- Internal Risk	.763	***	

Modified Model for "Internal Risks"



Modified Model for "Internal Risks"

Good Fit Indices for Modified Model "Internal Risks"

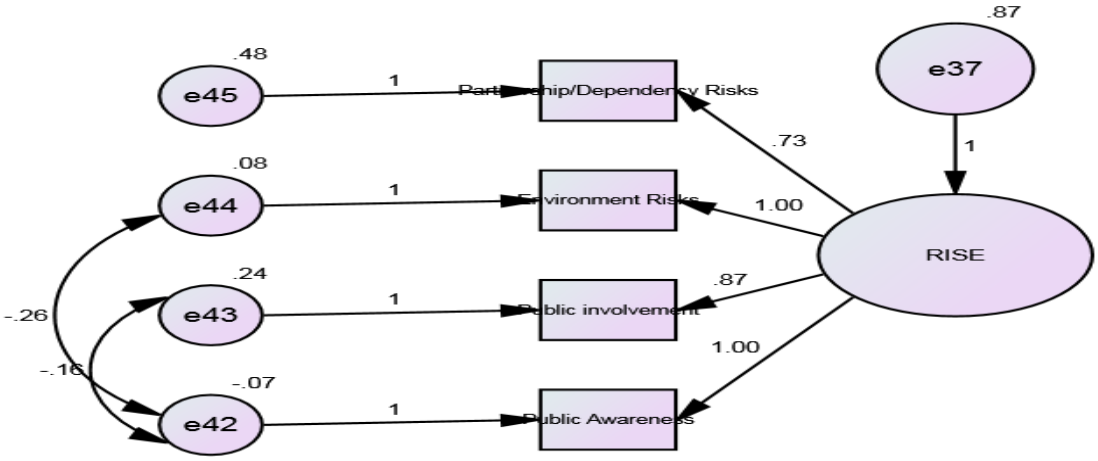
	Estimate	p-value	Goodness-of-Fit Indices
RISID <--- Internal Risk	.688	***	X^2 = 16.913; P = .000 CMIN/DF = 1.879; GFI = .982; AGFI =.928; CFI = .992; NFI = .984; TLI =.977; RMSEA= .064
RISIC <--- Internal Risk	.749	***	
RISIB <--- Internal Risk	.788	***	
RISIA <--- Internal Risk	.721	***	
RISIE<--- Internal Risk	.686	***	
RISIF<--- Internal Risk	.838	***	
RISIG <--- Internal Risk	.693	***	
RISIH <--- Internal Risk	.719	***	

E16 Measurement Model Analysis for "External Risks"

Good Fit Indices Measurement Model for "External Risks"

	Estimate	p-value	Goodness-of-Fit Indices
RISED <--- External Risk	.817	***	X^2 = 42.974; P = .000
RISEC <--- External Risk	.872	***	CMIN/DF = 21.487
RISEB <--- External Risk	.898	***	GFI = .909; AGFI =.546
RISEA <--- External Risk	.744	***	CFI = .930; NFI = .927; TLI =.789; RMSEA= .308;

Modified Measurement Model for "External Risks"



Modified Measurement Model for "External Risks"

Good Fit Indices for Modified Measurement Model "External Risks"

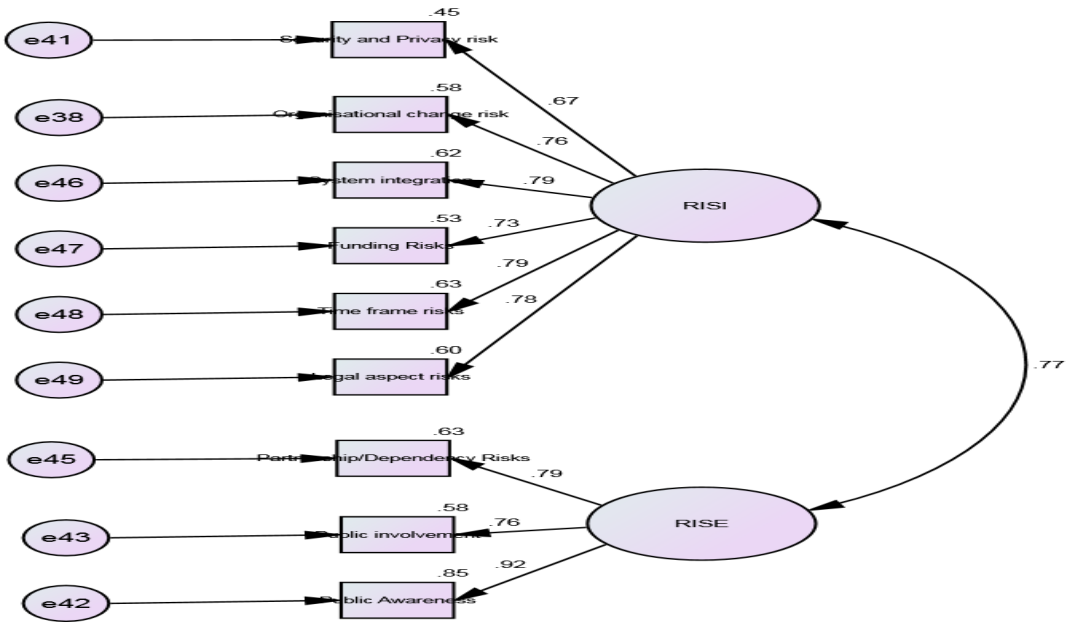
	Estimate	p-value	Goodness-of-Fit Indices
RISED <--- External Risk	1.042	***	X^2 = 1.346 ; P = .246
RISEC <--- External Risk	.855	***	CMIN/DF = 1.346;
RISEB <--- External Risk	.959	***	GFI = .997; AGFI =.969
RISEA <--- External Risk	.699	***	CFI = .999; NFI = .998; TLI =.996; RMSEA= .040;

E17 First-Order CFA for 'Risks'

GFIs for First-Order CFA of 'Risks'

	Estimate	p-value	Goodness-of-Fit Indices
RISID <--- Internal Risk	.719	***	X^2 = 305.590; P = .000 CMIN/DF = 5.766; GFI = .756; AGFI =.641; CFI = .863; NFI = .850; TLI = .829; RMSEA= .149; Standardized RMR = .070
RISIC <--- Internal Risk	.742	***	
RISIB <--- Internal Risk	.768	***	
RISIA <--- Internal Risk	.740	***	
RISIE<--- Internal Risk	.850	***	
RISIF<--- Internal Risk	.847	***	
RISIG <--- Internal Risk	.876	***	
RISIH <--- Internal Risk	.771	***	
RISED <--- External Risk	.729	***	
RISEC <--- External Risk	.776	***	
RISEB <--- External Risk	.753	***	
RISEA <--- External Risk	.787	***	

First-Order CFA Modified Measurement Model for 'Risks'



First-Order CFA Modified Measurement Model for 'Risks'

GFIs for First-Order CFA of Modified Measurement Model for 'Risks'

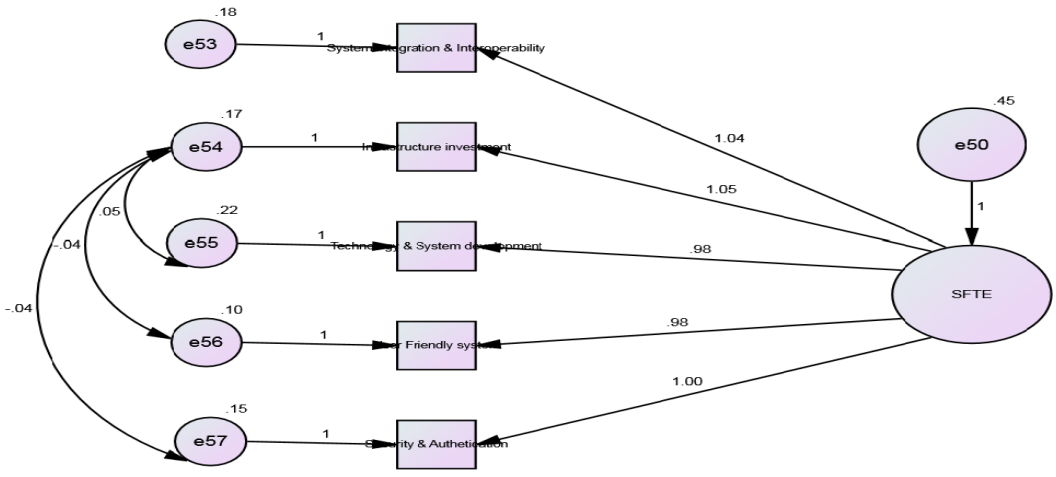
	Estimate	p-value	Goodness-of-Fit Indices
RISID <--- Internal Risk	.768	***	X^2 = 41.638 ; P = .003; CMIN/DF = 2.082; GFI = .953; AGFI =.915; CFI = .978; NFI = .959; TLI = .969; RMSEA= .071; Standardized RMR = .0353 Items deleted: RISIA RISIB RISIC RISEB
RISIE<--- Internal Risk	.805	***	
RISIF<--- Internal Risk	.719	***	
RISIG <--- Internal Risk	.796	***	
RISIH <--- Internal Risk	.774	***	
RISED <--- External Risk	.920	***	
RISEC <--- External Risk	.763	***	
RISEA <--- External Risk	.792	***	

E18 Measurement Model Analysis for "Technological factors"

GFIs for Measurement Model Analysis of "Technological factors"

	Estimate	p-value	Goodness-of-Fit Indices
SFTEE <--- Technological factors	.839	***	X^2 = 36.360; P = .000; CMIN/DF = 7.272; GFI = .933; AGFI =.798; CFI = .964; NFI = .958; TLI = .927; RMSEA= .170
SFTED <--- Technological factors	.869	***	
SFTEC <--- Technological factors	.854	***	
SFTEB <--- Technological factors	.846	***	
SFTEA <--- Technological factors	.864	***	

Modified Model for "Technological factors"



Modified Model for "Technological factors"

Good Fit Indices for Modified Model of "Technological factors"

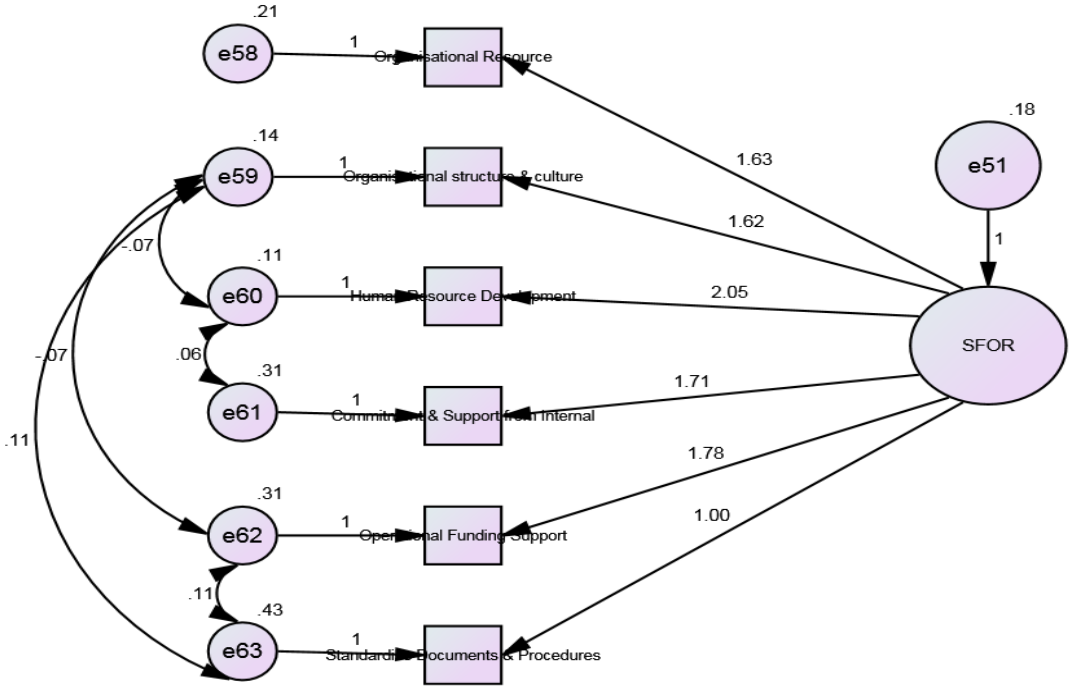
	Estimate	p-value	Goodness-of-Fit Indices
SFTEE <--- Technological factors	.864	***	X^2 = 3.899; P = .142; CMIN/DF = 1.950;GFI = .993; AGFI =.944; CFI = .998; NFI = .996; TLI = .989; RMSEA= .066
SFTED <--- Technological factors	.898	***	
SFTEC <--- Technological factors	.815	***	
SFTEB <--- Technological factors	.864	***	
SFTEA <--- Technological factors	.850	***	

E19 Measurement Model Analysis for "Organisational factors"

Good Fit Indices for Measurement Model of "Organisational factors"

	Estimate	p-value	Goodness-of-Fit Indices
SFORF <--- Organisational factors	.600	***	X^2 = 106.593; P = .000; CMIN/DF = 11.844; GFI = .875; AGFI =.709; CFI = .903; NFI = .895; TLI = .838; RMSEA= .224
SFORE <--- Organisational factors	.790	***	
SFORD <--- Organisational factors	.848	***	
SFORC <--- Organisational factors	.924	***	
SFORB <--- Organisational factors	.822	***	
SFORA <--- Organisational factors	.846	***	

Modified Measurement Model "Organisational factors"



Modified measurement Model for "Organisational factors"

Good Fit Indices for Modified Model of "Organisational factors"

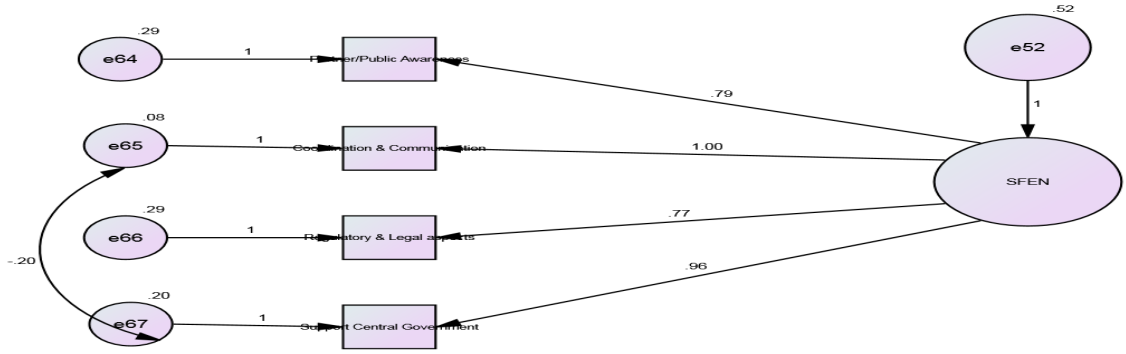
	Estimate	p-value	Goodness-of-Fit Indices
SFORF <--- Organisational factors	.545	***	X^2 = 8.771; P = .067; CMIN/DF = 2.193; GFI = .986;AGFI=.928; CFI = .995; NFI = .991; TLI = .982; RMSEA= .074
SFORE <--- Organisational factors	.805	***	
SFORD <--- Organisational factors	.798	***	
SFORC <--- Organisational factors	.937	***	
SFORB <--- Organisational factors	.881	***	
SFORA <--- Organisational factors	.835	***	

E20 Measurement Model Analysis for "Environmental factors"

Good Fit Indices for Measurement Model of "Environmental factors"

	Estimate	p-value	Goodness-of-Fit Indices
SFEND <--- Environmental factors	.692	***	X^2 = 51.033; P = .000; CMIN/DF = 25.516; GFI = .910; AGFI =.549; CFI = .881; NFI = .878; TLI = .642; RMSEA= .337
SFENC <--- Environmental factors	.763	***	
SFENB <--- Environmental factors	.823	***	
SFENA <--- Environmental factors	.797	***	

Modified Model for "Environmental factors"



Modified Model for "Environmental factors"

Good Fit Indices for Modified Model of "Environmental factors"

	Estimate	p-value	Goodness-of-Fit Indices
SFEND <--- Environmental factors	.692	***	X^2 = 4.920 ; P =.027; CMIN/DF = 4.920; GFI = .989 ; AGFI =.889 ; CFI = .990 ; NFI = .988; TLI = .943; RMSEA= .135
SFENC <--- Environmental factors	.763	***	
SFENB <--- Environmental factors	.823	***	
SFENA <--- Environmental factors	.797	***	

E21 First-Order CFA Measurement Model for 'Success Factors'

Good Fit Indices for First-order CFA Measurement Model 'Success Factors'

	Estimate	p-value	Goodness-of-Fit Indices
SFORF <---Organisational Factors	.739	***	X^2 = 318.993; P = .000; CMIN/DF = 7.250; GFI = .788; AGFI =.683; CFI = .868; NFI = .851; TLI = .835; RMSEA= .170; Standardized RMR = .1499
SFORE <---Organisational Factors	.873	***	
SFORD <---Organisational Factors	.905	***	
SFORC <---Organisational Factors	.954	***	
SFORB <---Organisational Factors	.896	***	
SFORA <---Organisational Factors	.901	***	
SFTEE <---Technological Factors	.919	***	
SFTED <---Technological Factors	.924	***	
SFTEC <---Technological Factors	.906	***	
SFTEB <---Technological Factors	.906	***	
SFTEA <---Technological Factors	.916	***	

GFIs for First-Order CFA Modified Measurement Model of 'Success Factors'

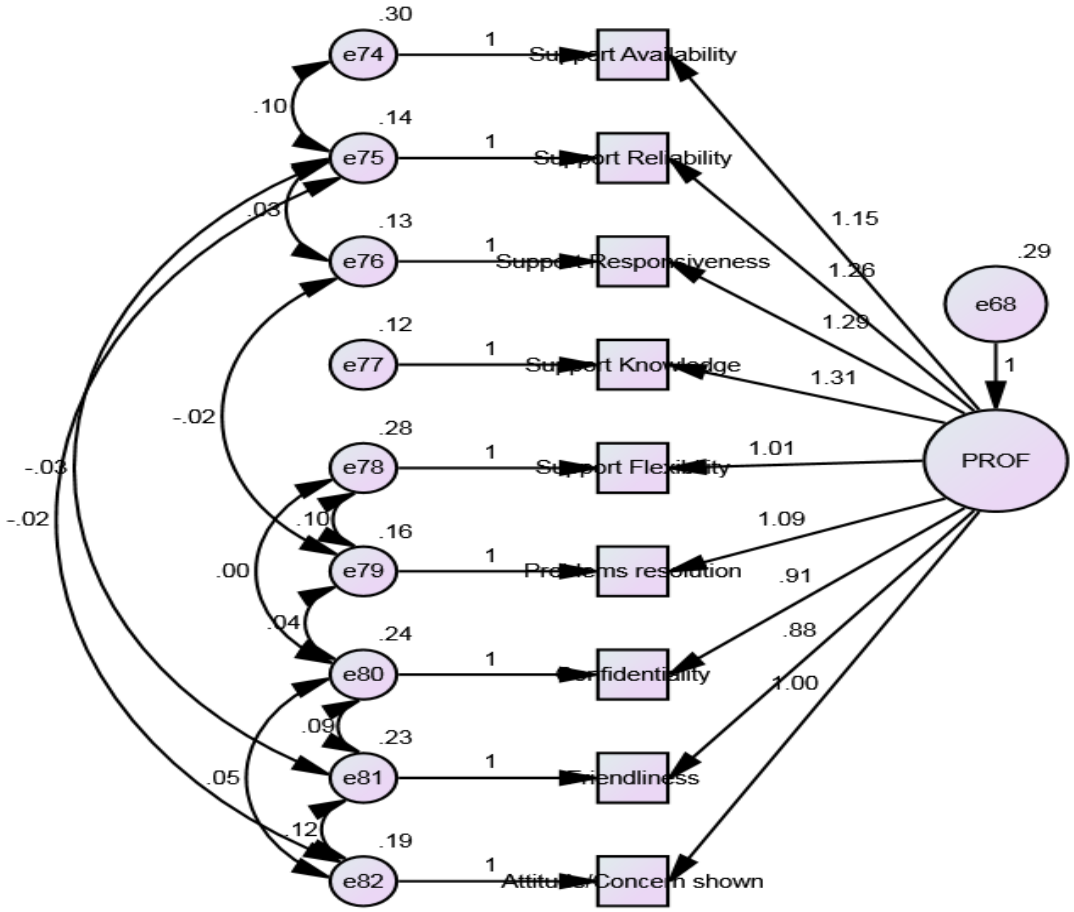
	Estimate	p-value	Goodness-of-Fit Indices
SFORD <---Organisational Factors	.921	***	X^2 = 110.353; P = .000; CMIN/DF = 5.518; GFI = .948; AGFI =.936; CFI = .936; NFI = .923; TLI = .910; RMSEA= .065; Standardized RMR = .0153 Deleted Items: SFORB SFORE SFORF
SFORC <---Organisational Factors	.970	***	
SFORA <---Organisational Factors	.887	***	
SFTEE <---Technological Factors	.920	***	
SFTED <---Technological Factors	.925	***	
SFTEC <---Technological Factors	.907	***	
SFTEB <---Technological Factors	.907	***	
SFTEA <---Technological Factors	.917	***	

E22 Measurement Model Analysis for "Professionalism"

Good Fit Indices for Measurement Model of "Professionalism"

	Estimate	p-value	Goodness-of-Fit Indices
PROFI <---Professionalism	.794	***	X^2 = 270.151 ; P = .000; CMIN/DF = 10.006; GFI = .781 ; AGFI = .634; CFI = .860 ; NFI = .848 ; TLI = .814 ; RMSEA= .204;
PROFH <---Professionalism	.734	***	
PROFG <---Professionalism	.740	***	
PROFF <---Professionalism	.832	***	
PROFE <---Professionalism	.740	***	
PROFD <---Professionalism	.881	***	
PROFC <---Professionalism	.878	***	
PROFB <---Professionalism	.888	***	
PROFA <---Professionalism	.780	***	

Modified Model for "Professionalism"



Modified Model for "Professionalism"

Good Fit Indices for Modified Measurement Model of "Professionalism"

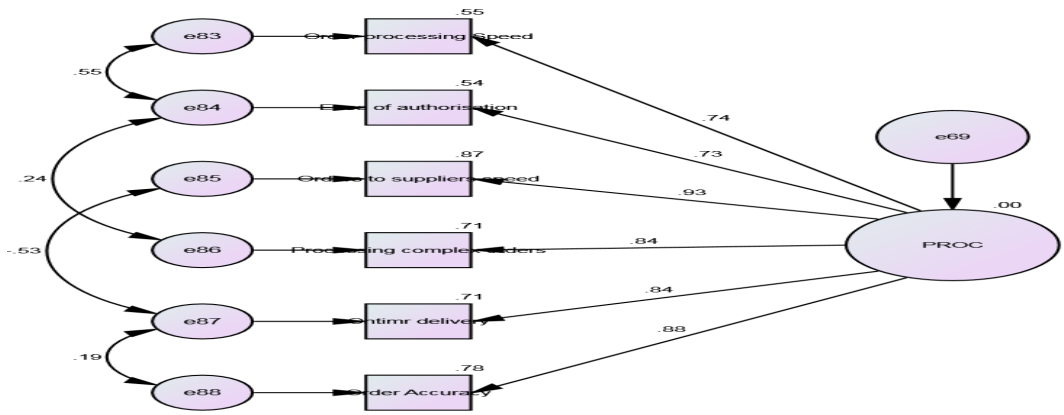
	Estimate	p-value	Goodness-of-Fit Indices
PROFI <---Professionalism	.775	***	X^2 = 21.248 ; P = .169 ; CMIN/DF = 1.328; GFI = .979 ; AGFI = .941 ; CFI = .997 ; NFI = .988 ; TLI = .993 ; RMSEA= .039
PROFH <---Professionalism	.700	***	
PROFG <---Professionalism	.707	***	
PROFF <---Professionalism	.827	***	
PROFE <---Professionalism	.718	***	
PROFD <---Professionalism	.898	***	
PROFC <---Professionalism	.888	***	
PROFB <---Professionalism	.875	***	
PROFA <---Professionalism	.751	***	

E23 Measurement Model Analysis for "Processing"

Good Fit Indices for Measurement Model Analysis of "Processing"

	Estimate	p-value	Goodness-of-Fit Indices
PROCG <---Processing	.667	***	X^2 = 137.990 ; P = .000 ; CMIN/DF = 9.856; GFI = .854 ; AGFI = .708 ; CFI = .901 ; NFI = .891; TLI = .851 ; RMSEA= .202;
PROCF <---Processing	.892	***	
PROCE <---Processing	.814	***	
PROCD <---Processing	.843	***	
PROCC <---Processing	.893	***	
PROCB <---Processing	.803	***	
PROCA <---Processing	.786	***	

Modified Measurement Model for "Processing"



Modified Measurement Model for "Processing"

Good Fit Indices for Modified measurement Model of "Processing"

	Estimate	p-value	Goodness-of-Fit Indices
PROCF <---Processing	.881	***	X^2 = 7.341; P = .197; CMIN/DF = 1.468; GFI = .989; AGFI = .954; CFI = .998 ; NFI = .993; TLI = .994 ; RMSEA=.047; Deleted item: PROCG
PROCE <---Processing	.843	***	
PROCD <---Processing	.841	***	
PROCC <---Processing	.932	***	
PROCB <---Processing	.733	***	
PROCA <---Processing	.739	***	

E24 First-Order CFA Measurement Model for 'Quality'

GFIs for First-Order CFA Measurement Model of 'Quality'

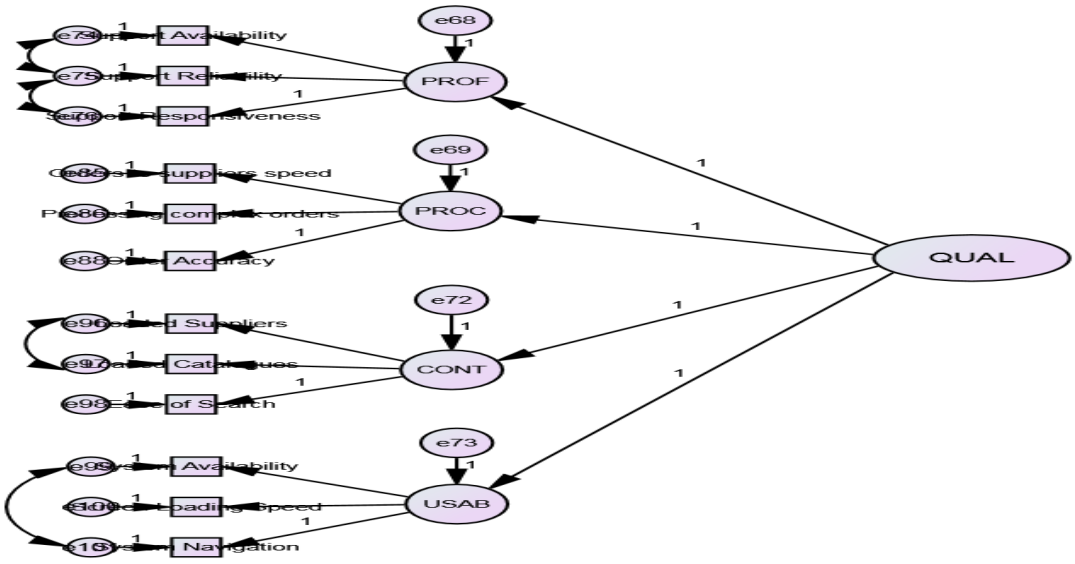
	Estimate	p-value	Goodness-of-Fit Indices
PROFI <---Professionalism	.800	***	X^2 = 1102.158 ; P = .000; CMIN/DF = 3.290; GFI = .727 ; AGFI = .670; CFI = .853 ; NFI = .804 ; TLI = .835 ; RMSEA= .103; Standardized RMR = .0842
PROFH <---Professionalism	.740	***	
PROFG <---Professionalism	.744	***	
PROFF <---Professionalism	.837	***	
PROFE <---Professionalism	.742	***	
PROFD <---Professionalism	.876	***	
PROFC <---Professionalism	.872	***	
PROFB <---Professionalism	.887	***	
PROFA <---Professionalism	.779	***	
PROCF <---Processing	.884	***	
PROCE <---Processing	.815	***	
PROCD <---Processing	.835	***	
PROCC <---Processing	.887	***	
PROCB <---Processing	.811	***	
PROCA <---Processing	.798	***	
TRAIC <---Training	.811	***	
TRAIB <---Training	.938	***	
TRAIA <---Training	.890	***	
SPECA <---Specification	.794	***	
SPECB <---Specification	.829	***	
SPECD <---Specification	.723	***	
CONTC <---Content	.744	***	
CONTB <---Content	.867	***	

	Estimate	p-value	Goodness-of-Fit Indices
CONTA <---Content	.852	***	
USABC <---Usability	.801	***	
USABB <---Usability	.892	***	
USABA <---Usability	.876	***	

GFIs for First-Order CFA Modified Measurement Model for 'Quality'

	Estimate	p-value	Goodness-of-Fit Indices
PROFE <---Professionalism	.821	***	X^2 = 94.821; P = .000; CMIN/DF = 1.975; GFI = .932; AGFI = .925; CFI = .976; NFI = .952; TLI = .966; RMSEA= .067; Standardized RMR = .0541 Deleted Items: PROFI, PROFH, PROFG, PROFF, PROFD, PROFA, PROCG, PROCE, PROCB, PROCA, TRAIC,TRAIB,TRAIA, SPECA, SPECB, SPECD
PROFC <---Professionalism	.850	***	
PROFB <---Professionalism	.984	***	
PROCF <---Processing	.889	***	
PROCD <---Processing	.843	***	
PROCC <---Processing	.921	***	
CONTC <---Content	.742	***	
CONTB <---Content	.872	***	
CONTA <---Content	.850	***	
USABC <---Usability	.797	***	
USABB <---Usability	.892	***	
USABA <---Usability	.879	***	

E25 Second-Order CFA Measurement Model for 'Quality'



Final Second-Order CFA Measurement Model for 'Quality'

GFIs for Second-Order CFA Modified Measurement Model for 'Quality'

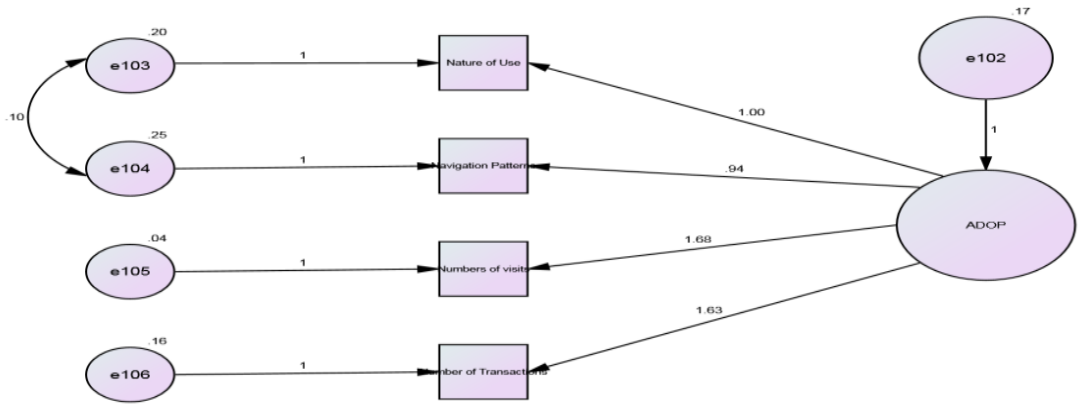
	Estimate	p-value	Goodness-of-Fit Indices
PROFA <---Professionalism	.814	***	X^2 = 75.617; P = .009; CMIN/DF = 1.543; GFI = .945; AGFI = .912; CFI = .986; NFI = .962; TLI = .981; RMSEA= .050; Standardized RMR = .0578
PROFC <---Professionalism	.860	***	
PROFB <---Professionalism	.915	***	
PROCF <---Processing	.903	***	
PROCD <---Processing	.850	***	
PROCC <---Processing	.925	***	
CONTC <---Content	.822	***	
CONTB <---Content	.734	***	
CONTA <---Content	.712	***	
USABC <---Usability	.853	***	
USABB <---Usability	.847	***	
USABA <---Usability	.926	***	

E26 Measurement Model Analysis for "Adoption"

Good Fit Indices for Measurement Model "Adoption"

	Estimate	p-value	Goodness--of-Fit Indices
ADOPD <---Adoption	.874	***	X^2 = 42.120 ; P = .000; CMIN/DF = 21.060; GFI = .914 ; AGFI =.571 ; CFI = .922; NFI = .919; TLI = .767 ; RMSEA= .305;
ADOPC <---Adoption	.935	***	
ADOPB <---Adoption	.654	***	
ADOPA <---Adoption	.715	***	

Modified Measurement Model for "Adoption"



Modified Measurement Model for "Adoption"

Good Fit Indices for Modified Measurement Model "Adoption"

	Estimate	p-value	Goodness-of-Fit Indices
ADOPD <---Adoption	.864	***	X^2 = 1.841; P = .017; CMIN/DF = 1.841; GFI = .996 ; AGFI =.958 ; CFI = .998 ; NFI = .996 ; TLI = .990 ; RMSEA= .062
ADOPC <---Adoption	.960	***	
ADOPB <---Adoption	.612	***	
ADOPA <---Adoption	.684	***	

E27 Structural Model "E-Procurement Adoption"

Good Fit Indices for Initial structural Model "E-Procurement Adoption"

	Estimate	p-value	Goodness-of-Fit Indices
PROFA <---Professionalism	.929	***	X^2 = 2212.578 ; P = .000; CMIN/DF = 1.990; GFI = .692; AGFI =.661; CFI = .880; NFI = .786; TLI = .873; RMSEA= .068
PROFC <---Professionalism	.848	***	
PROFB <---Professionalism	.898	***	
PROCF <---Processing	.857	***	
PROCD <---Processing	.979	***	
PROCC <---Processing	.833	***	
CONTC <---Content	.736	***	
CONTB <---Content	.869	***	
CONTA <---Content	.844	***	
USABC <---Usability	.924	***	
USABB <---Usability	.843	***	
USABA <---Usability	.859	***	
ADOPD <---Adoption	.882	***	
ADOPC <---Adoption	.914	***	
ADOPB <---Adoption	.694	***	
ADOPA <---Adoption	.737	***	
SFORD <---Organisational Factors	.822	***	
SFORC <---Organisational Factors	.937	***	
SFORA <---Organisational Factors	.880	***	
SFTEE <---Technological Factors	.845	***	
SFTED <---Technological Factors	.846	***	
SFTEC <---Technological Factors	.859	***	
SFTEB <---Technological Factors	.871	***	
SFTEA <---Technological Factors	.844	***	
RISID <--- Internal Risk	.794	***	
RISIE<--- Internal Risk	.765	***	
RISIF<--- Internal Risk	.923	***	
RISIG <--- Internal Risk	.735	***	
RISIH <--- Internal Risk	.802	***	

	Estimate	p-value	Goodness-of-Fit Indices
RISED <--- External Risk	.722	***	
RISEC <--- External Risk	.793	***	
RISEA <--- External Risk	.806	***	
CODIF<--- Direct Costs	.941	***	
CODIA<--- Direct Costs	.941	***	
CODIG<--- Direct Costs	.772	***	
COINC<--- Indirect Costs	.774	***	
COINB<--- Indirect Costs	.921	***	
COINA<--- Indirect Costs	.916	***	
BESTE <--- Strategic Benefits	.900	***	
BESTC <--- Strategic Benefits	.892	***	
BESTB <--- Strategic Benefits	.874	***	
BESTA <--- Strategic Benefits	.855	***	
BEOPE <--- Operational Benefits	.808	***	
BEOPC <--- Operational Benefits	.829	***	
BEOPB <--- Operational Benefits	.841	***	
BEOPF <--- Operational Benefits	.874	***	
BETAC <--- Tactical Benefits	.862	***	
BETAA <--- Tactical Benefits	.862	***	
BETAE <--- Tactical Benefits	.804	***	

Modified Structural Model for "E-Procurement Adoption"

Good Fit Indices for Modified Structural Model "E-Procurement Adoption"

	Estimate	**p-value**	**Goodness-of-Fit Indices**
PROFA <---Professionalism	.909	***	X^2 = 968.752; P =.043; CMIN/DF = 1.007; GFI = .954; AGFI =.914; CFI = .999; NFI = .906; TLI = .999; RMSEA= .006
PROFC <---Professionalism	.847	***	
PROFB <---Professionalism	.899	***	
PROCF <---Processing	.818	***	
PROCD <---Processing	.911	***	
PROCC <---Processing	.839	***	
CONTC <---Content	.843	***	
CONTB <---Content	.777	***	
CONTA <---Content	.730	***	
USABC <---Usability	.918	***	
USABB <---Usability	.835	***	
USABA <---Usability	.853	***	
ADOPD <---Adoption	.891	***	
ADOPC <---Adoption	.900	***	
ADOPB <---Adoption	.710	***	
ADOPA <---Adoption	.863	***	
SFORD <---Organisational Factors	.837	***	
SFORC <---Organisational Factors	.918	***	
SFORA <---Organisational Factors	.847	***	
SFTEE <---Technological Factors	.820	***	
SFTED <---Technological Factors	.841	***	
SFTEC <---Technological Factors	.889	***	
SFTEB <---Technological Factors	.863	***	
SFTEA <---Technological Factors	.841	***	
RISID <--- Internal Risk	.803	***	
RISIE<--- Internal Risk	.786	***	
RISIF<--- Internal Risk	.925	***	
RISIG <--- Internal Risk	.718	***	
RISIH <--- Internal Risk	.810	***	
RISED <--- External Risk	.751	***	
RISEC <--- External Risk	.759	***	
RISEA <--- External Risk	.830	***	
CODIF<--- Direct Costs	.934	***	
CODIA<--- Direct Costs	.945	***	
CODIG<--- Direct Costs	.918	***	
COINC<--- Indirect Costs	.783	***	
COINB<--- Indirect Costs	.904	***	

	Estimate	**p-value**	**Goodness-of-Fit Indices**
COINA<--- Indirect Costs	.939	***	
BESTE <--- Strategic Benefits	.861	***	
BESTC <--- Strategic Benefits	.879	***	
BESTB <--- Strategic Benefits	.938	***	
BESTA <--- Strategic Benefits	.810	***	
BEOPE <--- Operational Benefits	.787	***	
BEOPC <--- Operational Benefits	.898	***	
BEOPB <--- Operational Benefits	.846	***	
BEOPF <--- Operational Benefits	.876	***	
BETAC <--- Tactical Benefits	.883	***	
BETAA <--- Tactical Benefits	.844	***	
BETAE <--- Tactical Benefits	.837	***	

E28 Constructs and Variables in the Model

Lists of variables in the model

Construct	Unobserved variable	Observed variables	Model	
			Conceptualised	**Structural**
Benefits	Strategic	Transparency	√	√
		Competitiveness	√	√
		Public opinion	√	√
		Communication and Coordination	√	×
		Accountability	√	√
	Operational	Minimise operational cost	√	×
		Reduce cycle time	√	√
		Minimise intervention	√	√
		User friendly	√	×
		Efficient workflow	√	√
		Security and confidentiality	√	√
	Tactical	Document standardisation	√	√
		IT penetration	√	×
		Fair competition	√	√
		Curb corruption	√	×
		Regulatory compliance	√	√
Costs	Direct	Infrastructure investment	√	√
		Human resource development	√	×
		Operational and maintenance	√	×
		System development and upgrade	√	×
		Rewards, incentives and salary	√	×
		Hardware and IT equipment	√	√
		Server and internet	√	√
		Consultancy support	√	×
	Indirect	Social	√	√
		Partnership	√	√
		Organisational	√	√
		Overtime cost	√	×

		Staff working motivation	√	×
		strains on resources	√	×
Risk	Internal	Security and privacy	√	√
		Internet and network	√	×
		Human risk	√	×
		Organisational change	√	√
		System integration	√	√
		Funding	√	√
		Time-frame	√	√
		Legal aspects	√	√
	External	Partnership	√	√
		Environment	√	×
		Public involvement	√	√
		Public awareness	√	√
Success Factors	Technological	System integration and interoperability	√	√
		Infrastructure investment	√	√
		Technology and system development	√	√
		User friendly	√	√
		Security and authentication	√	√
	Organisational	Resources	√	√
		Structure and culture	√	×
		Human resource development	√	√
		Commitment and support	√	√
		Funding support	√	×
		Standardised documents	√	×
	Environmental	Partner/public awareness	√	×
		Coordination	√	×
		Regulatory and legal aspects	√	×
		Central government support	√	×
Quality	Professionalism	Support availability	√	√
		Support reliability	√	√
		Support responsiveness	√	√
		Support knowledge	√	×
		Support flexibility	√	×
		Problems resolutions	√	×

		Confidentiality	√	×
		Friendliness	√	×
		Attitude/concern shown	√	×
	Processing	Order processing	√	×
		Ease of authorisation	√	×
		Orders to suppliers speed	√	√
		Processing complex orders	√	√
		On-time delivery	√	×
		Order accuracy	√	√
		System security	√	×
	Training	Timely training	√	×
		Appropriate training	√	×
		Information provision	√	×
	Specification	FMS integration	√	×
		System configurability	√	×
		Reporting capabilities	√	×
	Content	Loaded suppliers	√	√
		Loaded catalogues	√	√
		Ease of search	√	√
	Usability	System availability	√	√
		Screen loading speed	√	√
		System navigation	√	√
Adoption		Nature of use	√	√
		Navigation patterns	√	√
		Number of visits	√	√
		Number of transactions	√	√
Notes: √ = Remained × = Removed				

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